



**Town of Arlington  
Department of Community Safety  
Fire Service and Inspection Division**

Administrative Office

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Richard J. Maimone  
Director of Fire Services

**MEMORANDUM**

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TO: Arlington Board of Selectmen  
cc: Philip J. Farrington, Town Manager

FROM: Richard J. Maimone, Director of Fire Services

DATE: May 24, 2002

RE: Fire Department Facilities Study

MMA Consulting Group, Inc. has completed the above referenced study requested by the Capital Planning Committee. A copy was given to you this month for your review.

The primary recommendations in this report include the following recommendations:

- The Town of Arlington should operate with a two fire station configuration.
- The Park Circle Station should be decommissioned.
- The personnel should be reassigned to other fire companies to strengthen fire, rescue and emergency medical response.
- The Fire Services Division should implement a new deployment strategy.
- The Fire Services Division should be reorganized. Two new Assistant Chief positions should be established: Assistant Chief for Operations and Assistant Chief for Support Services.
- The Division should maintain 15 firefighters on-duty as a minimum staffing level.

After reviewing this report I disagree with many of their recommendations, most notably the decommissioning of the Park Circle Fire Station. It is still my strong recommendation that the Town of Arlington maintain a three-station concept in terms of faster response times to all locations. I respectfully ask that you review the memorandum dated May 17, 2002 that I sent you.

I have reservations about their recommendation to reassign personnel to other fire companies and some of the new deployment strategies. Particularly, operating with only three front-line fire apparatus (one quint, one ladder, one engine) and the rescue/ambulance and discontinuing the practice of deploying first responder companies to non-life threatening medical emergencies.

A concern about simultaneous incidents and response times from the Headquarters station when apparatus from Highland station is deployed is alarming. MMA did not provide additional mapping to illustrate and address this concern in their final report.

It is clear that these recommendations are taken from the controversial National Fire Protection Association (NFPA) 1710 standard. The International City Management Association (ICMA), the National League of Cities, the Public Risk Management Association, the International Personnel Management Association and other associations have filed complaints with the American National Standards Institute (ANSI) to withdraw Standard 1710. The ANSI has an oversight role relating to standards set by organizations, such as NFPA. The ANSI evaluates the methods by which standards are adopted.

NFPA 1710 covers the staffing, deployment and response times for fire companies and ambulances on career fire departments.

Following is a basic matrix of NFPA 1710:

First-unit response time*	4 minutes
Initial Full Assignment response time*	90% of the time
First-unit staffing/arrival	8 minutes
Assignment staffing for full response	90% of the time
Initial attack time	4 persons minimum
	14-15 persons
	n/a

\* Does not include 60-second 911 call-processing time or 60-second turnout time.

Support for the standard came from a unique labor-management coalition led by the International Association of Fire Fighters and the International Association of Fire Chiefs, which produced an overwhelming vote in favor of the standard. The idea of creating a "national standard" came about because many local officials have used their fire departments as the place to save money. Pleas and warnings from fire chiefs were ignored and closing fire stations and reducing personnel assigned to fire companies was a way to save money. There would be no need for 1710 if these officials had not failed in their responsibility to provide the proper level of fire and EMS protection.

Town officials in Arlington did not follow this trend. Arlington felt the budget constraints of Proposition 2½, which caused a reduction of 35 uniformed firefighter positions, reduced minimum response capabilities from 4:3 engines companies and 2:1 ladder trucks. As a result, minimum staffing per group/shift was also reduced from 23 firefighters to the present level of 15. But it did not force the closing of fire stations or deplete the minimum number of firefighters assigned to fire companies.

The standard was intended to improve response times and have a minimum number of personnel on scene. Currently the Arlington Fire Department exceeds the

response times recommended in NFPA 1710 and meets the staffing assignments for full responses.

It is my belief that staffing our fire apparatus with three (3) firefighters does not jeopardize their safety or deplete our ability to prevent loss of life to our residents.

If MMA's recommendations increased the level of service to our citizens/customers or our response capabilities I could support the recommendations for a two-station deployment; but they do not. In fact, we would be reducing the level of service currently offered. I do not support reducing the level of service just to meet the recommendations of a "national model".

I do, however, support their recommendations for more staff personnel and for the fire department to develop a specific plan to provide ALS service to the community.

I look forward to meeting with you and the Town Manager to present my recommendations for deployment, staffing and levels of service at the June 3<sup>rd</sup> Selectmen's meeting.



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Richard J. Maimone  
Director of Fire Services

**MEMORANDUM**

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**TO:** Arlington Board of Selectmen  
**cc:** Philip J. Farrington, Town Manager

**FROM:** Richard J. Maimone, Director of Fire Services

**DATE:** May 17, 2002

**RE:** Justification for Park Circle Fire Station

For the average citizen, the first image that comes to mind when the fire service is mentioned may well be the doors to a fire station opening and one or more vehicles emerging to speed off dramatically to the scene of a fire. This popular image is not without merit, for the location and physical design of fire stations, and their successful ongoing management, are prime determinants of a community's ability to respond to fires. Having the right type and number of fire stations, located in the right places, enables the policymakers and appointed managers of a jurisdiction to house firefighters, apparatus, and equipment in a rational way for maximum use of resources. Doing this successfully may be a key test of managerial ability (both inside and outside the fire department) in a local government setting increasingly more marked by competition for scarce resources.

Conversely, the penalties are high—and extremely visible—for poor location or design of facilities, or for poor management of facilities; and these penalties are felt by the fire department itself, by the local government, and, indeed, by the local taxpayers. With poor location and design of facilities, response times become excessive and if a tragedy occurs that incident may be well publicized. Firefighter morale may suffer—it should be remembered that the fire station and its status as an environment for both working and living are of concern to employees in a special way; no other local government department has a parallel situation. When location and design of facilities, and morale, are poor fire station related injuries increase, as do costs for maintenance, energy consumption, and operations.

Initial costs for a new fire station may seem high, especially at first glance. Half a million to a million dollars was not unusual as an estimated cost for a new station in the late 1970's and the question today is how much this figure will go up.

A comparison of the actual design and construction costs for a new station with the long-term costs of operating the facility over its lifetime, however, makes a striking fact evident: compared to the costs of firefighting equipment and apparatus and building

maintenance, the price of the station itself is small. Actual costs for building the station are only a fraction of the total operational costs for the fire station over its lifetime.

If this argument is turned around, then it clearly makes a great deal of managerial sense to pay close attention to fire station location and design. Without great additional construction expense, response time can be improved and the fire stations can be designed to function more efficiently; to be more easily maintained; to consume less energy; to be better protected against damage from potential natural hazards and from vandalism; and to adjust more readily to changes in apparatus design, staff levels, and department operations. Skimping on initial costs for a new fire station can prove to be a very costly mistake a few years later. An increasing number of decision makers in local government are recognizing these facts. But this was not always the case.<sup>1</sup>

Based upon twenty-nine years of experience and a thorough knowledge of the Town with respect to public safety it is my belief that the Park Circle fire station should remain at or near its present location.

Located across from the Park Circle water tower at 291 Park Avenue this station is staffed around the clock with one officer and two firefighters. Built in the mid-late 1920's as a sub-station it was expanded in the 1930's as a (WPA) project.

The fire apparatus assigned to this station is a 1250 gpm fire engine (pump) identified as Engine 3. This front line engine company has a 500 gallons water tank, pre-connected attack lines (hose), supply hose to connect to fire hydrants, medical supplies and all equipment necessary to perform the tasks of an Engine Company.

The area to be protected is the most important factor in determining fire station locations.<sup>2</sup> This vehicle covers a substantial area of Arlington Heights west of Highland Avenue to the Lexington line, which includes a sizeable section of Route 2 westbound from the Morton Road access to the Lexington town line.

A study of fire suppression operations, conducted in 1986 by Cresap, McCormick and Paget, stated, "that the present number and location of fire stations in Arlington was adequate for responding to emergencies." There were a total of 3,634 incidents in 1985. Last year the Fire Services Division responded to 4,784 incidents. As noted in the enclosed report the number of incidents increased by 24% and although the total number of fires decreased the number of structure fires actually increased by 33% and medical incidents increased substantially.

Engine 3 responded to 541 incidents during 2001 two-thirds of which were medical in nature. The average response time from receipt of alarm to arrival on scene was three minutes. Two emergency medical technicians (EMT's) are assigned to Park Circle fire station daily. All of Arlington's firefighters are trained to the first responder level and are de-fib certified. External cardiac defibrillators are standard equipment on all fire apparatus.

<sup>1</sup> Managing Fire Services – International City Management Association (ICMA)

<sup>2</sup> National Fire Protection Association (NFPA)

When a call for medical assistance is received for the Park Circle district Engine 3 is dispatched together with Rescue 1 and, if determined by dispatch, paramedics from the North Suburban Emergency Medical Consortium (located at Armstrong Ambulance). In most cases the engine company will arrive two minutes before the Rescue. The primary responsibility of this company is to determine the nature of the medical emergency, acquire as much pertinent information as possible from the patient with respect to past medical history, medications taken, allergies to any medications, name of physician and any other significant information. In addition vital signs (blood pressure, pulse, rate of respirations) are taken and if necessary oxygen therapy is begun. Wounds are dressed and bandaged, fractures immobilized and traction is provided where spinal cord injuries are suspected, and the patient is comforted and treated for shock.

If, upon arrival, the patient is unresponsive they will determine if the patient is breathing and has a pulse and if not will begin cardiopulmonary resuscitation (CPR). The external cardiac defibrillator will be connected to the patient and if warranted the patient will be shocked into a normal heart rhythm.

In the past twelve months the defibrillator was connected to eighteen patients and external cardiac defibrillation along with cardiopulmonary resuscitation was initiated. Needless to say, in any emergency situation, the sooner trained personnel arrive at an incident the chances of a successful outcome are greatly increased.

Engine 3 responded to 176 reports of fire last year. The first arriving engine company is responsible for the initial size-up of an incident. The company officer will determine if there is a life hazard and if so will begin search and rescue operations with one other firefighter. If not, this team is responsible to advance the initial attack line (hose) into the building, locate the seat of the fire and begin extinguishing operations.

The terrain in Arlington Heights is unique in that two large hills are on either side of Massachusetts Avenue—Park Circle and Turkey Hill. For this reason there are gravity fed water towers at both locations. The incline to Turkey Hill is more gradual than to Park Circle. Considering this fact, response times will greatly increase if this station is eliminated especially during the winter with the addition of snow and ice. Delaying the arrival of the first arriving engine company will prove critical to the life safety of residents and firefighters. The sooner hose lines are placed into operation and search and rescue efforts have begun loss of life and property is significantly reduced.

Mobile radio equipment is located in the attic of the Park Circle fire station. Fire and police antennas are mounted on the roof of this station for local radio frequencies and shared frequencies of Metro-fire and Bayburn police channels. Radio communications play a vital role to the safety of personnel at all incidents. In addition, an antenna for Armstrong Ambulance Service and a local taxi company are also at this location. Support personnel of the Fire Services Division maintain this equipment. Loss of this location could jeopardize the licensing of our radio frequencies.

The fire service is responsible for the life safety of its citizens and its firefighters and the protection of property, in that order. There are a number of occupancies in this district considered high life-hazards including three schools and a nursing home. Park Circle is the closest station to Route 2. Engine 3 covers the section westbound between Morton Road to the Lexington Line. Timely responses to motor vehicle accidents

including rollovers and vehicle fires are fundamental in saving lives. Property values in the Park Circle area average between \$375,000 - \$475,000.

As Chief of the Arlington Fire Department and a resident of Arlington, I have come to know first-hand the professionalism the members of the Fire Services Division display each time they respond to an emergency incident. Of particular importance is their ability to arrive at any location in Arlington within an average of three minutes from receipt of the alarm. The elimination of the Park Circle fire station will increase response times, jeopardize the safety of the residents in this section of Arlington and to the firefighters, whose job it is to protect those they serve.

In closing, I hope you are as convinced as I am that a new fire station should be built at or near the present site to serve the citizens of Arlington Heights well into the 21<sup>st</sup> century.

enc.

### Number of Incidents by Type

**1985**

<u>Type of Incident</u>	<u># of Responses</u>
False/Accidental	971
Medical	648
Fires:	
Structure	62
Grass/Rubbish	344
All Other	94
Total:	500
Service Calls (a)	335
Hazardous Conditions (b)	235
Unclassified	945
Total:	3,634

**2001**

<u>Type of Incident</u>	<u># of Responses</u>
False	80
System Malfunction	336
Total:	416
Medical	2,237
Patient Assists	98
Total:	2,335
Fires:	
Structure	93
Smoke Scare	261
Outside	39
Vehicle	16
All Other	46
Total:	455
Lockouts	82
Water Evacuation	143
Total:	225
Hazardous Conditions (b)	254
Pressure Explosions	5
Total:	259
Otherwise Unclassified	1094
Total:	4,784

(a) Includes lockouts, water evacuation  
smoke and odor removal, animal rescue  
and unauthorized burning.

(b) Includes gas leaks, gasoline spills and  
downed power lines.

1985 Source: Data obtained from documentation  
of all 3,634 fire alarms received in 1985.

2001 Source: Data obtained from documentation  
of all 2001 Incident Reports.

### **Park Circle District – Areas of Concerns**

- Route #2:** Morton Road to Lexington Line
- State Property:** Massachusetts DPW – Appleton Street  
MWRA Pumping Station – Spring Street
- Schools:** Brackett  
Dallin  
Ottoson Middle School  
Germaine Lawrence  
May Center
- Churches:** Saint Camillus  
Saint Paul Lutheran  
Park Avenue Congregational
- Nursing Home:** Park Avenue Nursing and Rehabilitation Center
- Skyline Park:  
(Robbins Farm)** Numerous sledding accidents each winter
- Poet's Corner:** Extensive brush – on several occasions brush fires have threatened houses on Campbell Road.
- Arlmont Village:** Furthest distance to respond should Park Circle fire station close.

**ARLINGTON, MASSACHUSETTS**

**FIRE DEPARTMENT FACILITIES STUDY**

**MAY 2002**

**MMA CONSULTING GROUP, INC.  
41 WEST STREET  
BOSTON, MASSACHUSETTS 02111**

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## I. EXECUTIVE SUMMARY

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MMA Consulting Group, Inc. was retained by the Town of Arlington to conduct a *Fire Department Facilities Study*. One of the principal purposes of the study was to evaluate the Town's proposed capital plan to rehabilitate its fire stations. The plan is estimated to cost at least \$10.67 million. Under this plan, Headquarters Station and Highland Station would be renovated and the Park Circle Station would be demolished and rebuilt.

A primary concern of this analysis is whether fire and rescue services should be provided from two or three stations and whether the Park Circle Station is required to meet the needs of the Town. Additionally, once the number and location of fire stations is determined, the Fire Services Division's deployment and staffing policies must be evaluated and linked to a new station configuration.

The consultants were asked by the project committee, composed of representatives of the Capital Planning Committee, the Fire Services Division, and the Town Manager's office, to review several fire station response models, or configurations. These models included the current three-station configuration, a two-station configuration, and an alternative three-station configuration. To conduct this study, several consultants conducted field work to examine the response capability of the Division, its deployment approach and the characteristics of Arlington. In summary, the study included:

- an analysis of current fire station locations, the viability of current fire station locations, and relocation or consolidation strategies
- an evaluation of the adequacy and the mix of engine, ladder, rescue, and specialized units, and the deployment of units to meet response needs
- a review of deployment strategies
- consideration of decommissioning the Park Circle Station

Part of the study process required the development of a series of computer maps. The mapping required preparation of a digitized base map

representation of the Arlington street and highway network, locating the fire stations to be analyzed with respect to that network, reviewing the topography of the Town, assigning average speeds to the various types of streets in the Town and adjusting speeds for streets, or sections of streets, influenced by steep gradients, and generating color-coded maps indicating travel times, in one-minute intervals, from the fire stations to the borders of the community. Three maps are presented in this report.

In summary, the analysis indicates that the Town of Arlington can effectively deliver fire and rescue services to residents by operating with a two fire station configuration. The location of stations at One Monument Park (Station 1, Headquarters Station) and 1007 Massachusetts Avenue (Station 2, Highland Station) effectively serve the Town, permit meeting response standards and benchmarks, and are almost ideally located. The fire station located at Park Circle (Station 3) is an old and inadequate facility which should be closed and personnel should be reassigned to units at the remaining two stations to strengthen the response capability of these units.

The primary recommendations in this report include:

- The Town of Arlington should operate with a two fire station configuration.
- The Park Circle Station should be decommissioned.
- The personnel should be reassigned to other fire companies to strengthen fire, rescue and emergency medical response.
- The Fire Services Division should implement a new deployment strategy.
- The Fire Services Division should be reorganized. Two new Assistant Chief positions should be established: Assistant Chief for Operations and Assistant Chief for Support Services.
- The Division should maintain 15 firefighters on-duty as a minimum staffing level.

In the text of this report, two deployment options are described. The first Redeployment Plan (Option 1) illustrates the possible deployment in a

two-station configuration, using four major pieces of fire apparatus. The second Redeployment Plan (Option 2) illustrates another deployment model, using three major pieces of apparatus. The consultants believe that Option 2 is the most desirable approach.

**REDEPLOYMENT PLAN (OPTION 1)  
(MINIMUM OF 15 ON-DUTY PERSONNEL)**

<i><b>Headquarters Station</b></i>		<i><b>Highland Station</b></i>	
	<b>NUMBER OF FIREFIGHTERS</b>		<b>NUMBER OF FIREFIGHTERS</b>
Deputy Chief	1		
Engine 4	3	Quint Apparatus	3
Engine 1	3		
Ladder 1	3	Rescue 1 (Ambulance)	2
<b>Total</b>	<b>10</b>		<b>5</b>

**REDEPLOYMENT PLAN (OPTION 2)  
(MINIMUM OF 15 ON-DUTY PERSONNEL)**

<i><b>Headquarters Station</b></i>		<i><b>Highland Station</b></i>	
	<b>NUMBER OF FIREFIGHTERS</b>		<b>NUMBER OF FIREFIGHTERS</b>
Deputy Chief	1		
Engine 4	4	Quint Apparatus	4
Ladder 1	4	Rescue 1 (Ambulance)	2
<b>Total</b>	<b>9</b>		<b>6</b>

Three organizational options are discussed in Chapter V of this report; the two most viable options are shown here. The following table shows the current staffing structure and two model rank structures. Option 2 is the most desirable model.

CURRENT ORGANIZATION AND PROPOSED ORGANIZATIONAL MODELS

POSITION	CURRENT ORGANIZATION	OPTION 1	OPTION 2
Director	1	1	1
Assistant Chief	0	2	2
Deputy Chief	5	4	4
Captain	7	5	7
Lieutenant	15	11	9
Firefighter	58	63	63
Total	86	86	86

On the following pages, each major recommendation presented in the report is listed along with a priority assignment of 1 (highest), 2, or 3 (lowest). A summary of the intended result is also shown. Priorities are defined as follows:

**PRIORITY 1:** Those recommendations which should be implemented without delay and which bear most directly on the ability of the Division to provide services and operate in an efficient manner. Priority 1 items need to be addressed immediately, even though they may require several months or years to implement completely.

**PRIORITY 2:** Those recommendations which are important to the effective and efficient operation of the Division and which should be implemented as soon as reasonable and practical.

**PRIORITY 3:** Those recommendations which can contribute to the continued improvement of the Division and which should be implemented as soon as resources and operating conditions permit.

RECOMMENDATION	PRIORITY
IV-1 The Town should decommission the Park Circle Fire Station.	1
IV-2 The Town should provide fire and rescue services using a two fire station configuration.	1
IV-3 Headquarters and Highland Stations should be retained as the base of operations for a two-station response system.	1
V-1 Continue to maintain a minimum of 15 personnel on-duty.	1
V-2 Implement redeployment, using a two-step plan, and reassign the 12 firefighters from the Park Circle Station.	1

RECOMMENDATION	PRIORITY
V-3 Relocate personnel from Engine 3 and Rescue 2 from the Park Circle Station to the Highland Station.	1
V-4 Staff Rescue 1 with two FF/EMTs.	1
V-5 Staff Ladder 2 daily with an officer and two firefighters.	1
V-6 Staff Rescue 2 as a second ambulance, as required.	2
V-7 Under the initial redeployment model, staffing should include two engine companies (each with three firefighters), two ladder companies (each with three firefighters), one rescue (ambulance), and a Deputy Chief daily.	1
V-8 Purchase a quint apparatus (aerial apparatus with pump capability). Assign the quint to the Highland Station.	1
V-9 Implement Redeployment Plan Option 1.	1/2
V-10 Implement Redeployment Plan Option 2.	1/2
V-11 The Division should develop an apparatus relocation and deactivation schedule.	2
V-12 Assign one Captain and three Lieutenants to each fire company.	2
V-13 Reorganize the Fire Services Division.	2
V-14 The Assistant Chief positions should be management positions.	2
VI-1 Continue the dual response of a first responder company and an ALS provider for life-threatening emergencies (ALS response).	1
VI-2 Discontinue the practice of deploying a first responder fire company to non-life-threatening medical emergencies (BLS), as determined by emergency medical dispatching procedures.	1
VI-3 Continue to deploy a first responder fire company to life-threatening medical emergencies (ALS), as determined by emergency medical dispatching procedures.	1
VI-4 Continue to implement an emergency medical dispatch system.	1/2
VI-5 The Fire Services Division and the Town Manager's office should develop a specific plan to determine the number of EMT-Paramedic trained personnel required to provide ALS services.	3
VI-6 Use civil service selective certification procedures to seek recruits who are trained and certified as Commonwealth of Massachusetts EMT-Paramedics, prior to employment.	3
VI-7 Consider the development of an EMT-Paramedic training program within the Division to provide for selected training of current personnel who may aspire to be trained as EMT-Paramedics.	3

RECOMMENDATION	PRIORITY
VI-8 Upon recruiting and training an adequate number of EMT-Paramedics into the Division, upgrade the current first responder program from a BLS delivery system to an ALS delivery system.	3
VI-9 Apply to the Commonwealth of Massachusetts for a waiver to respond to medical emergencies as an ALS provider through a first responder program.	3

This report is organized into several chapters. This first chapter provides a summary of the major findings and recommendations presented in this report. Chapter II, *Background Information*, provides information on the Town of Arlington and the Fire Services Division. Chapter III, *Fire Rescue Objectives, Benchmarks, and Response Parameters*, describes the underlying principles, standards, and benchmarks which define how a fire and rescue department can measure its performance and establish a service level framework. Chapter IV, *Computer Mapping and Station Location Evaluation*, analyzes the current three-station configuration, a two-station configuration and an alternative three-station configuration. The chapter also measures the response capability of the Division by evaluating the number of street miles, the number of square miles and the number of residents that can be serviced by the Division in defined time parameters (one, two, three and four minutes). Chapter V, *Deployment and Organization*, describes a new organization and deployment model for adoption by the Fire Services Division. Chapter VI, *Emergency Medical Services*, briefly describes some of the EMS issues facing the Town and Chapter VII, *Plan of Implementation*, outlines a plan to implement the major recommendations contained in the report.

The following list provides a glossary of terms used in this report.

AED	Automatic External Defibrillator
ALS	Advanced Life Support
BLS	Basic Life Support
EMD	Emergency Medical Dispatching
EMS	Emergency Medical Services
EMT	Emergency Medical Technician
ISO	Insurance Services Office
NFPA	National Fire Protection Association
PSAP	Public Service Answering Point

## **II. BACKGROUND INFORMATION**

### **THE TOWN OF ARLINGTON**

The Town of Arlington is an inner suburb located six miles northwest of Boston and bordered by the cities of Cambridge, Medford and Somerville and the town of Winchester on the east and north, and the towns of Belmont and Lexington on the south and west. The Town is primarily a residential community with important retail and service establishments located primarily along Massachusetts Avenue which bisects the Town, running generally southeast to northwest. The 2000 census counted 19,411 housing units; of these, almost 98 percent were occupied. Owner-occupied units represented 59 percent of the total and 41 percent were renter-occupied. Most units are of wood-frame construction and vary in age, but the majority are post-1930 construction.

Arlington has a total area of 5.5 square miles. There are .33 square miles of water area, chiefly in Spy Pond and Mystic Lake. The principal highways accessing the Town include Massachusetts Routes 2 and 2A and U.S. Route 60.

### **CENSUS COUNTS**

The 2000 United States Census counted 42,389 persons in the resident population, a net decrease of 2,241 persons, or a five percent reduction from the 1990 total. The Town had steadily increased from 1930 until its highest count in 1970 (53,524). However, in each of the three most recent enumerations, there have been significant declines. The decreases can be attributed to generally smaller family and household sizes, gradual empty nesting, and net out-migration.

### **EXHIBIT II-1 ARLINGTON CENSUS**

YEAR	TOTAL POPULATION	10-YEAR PERCENT CHANGE
1930	36,094	
1940	40,016	10.9%
1950	44,353	10.8%
1960	49,953	12.6%
1970	53,524	7.1%
1980	48,219	-9.9%
1990	44,630	-7.4%
2000	42,389	-5.0%

At the same time the population has been decreasing, the number of households in the Town has slowly increased. Household growth in Arlington appears to have leveled off in the 2000 census, as shown in Exhibit II-2. Consistent with the observed population decline, average household size in 1970 was 3.04 persons. By 2000, this had decreased to 2.22 persons. The average household size in 2000 had decreased approximately 37 percent from household size ten years earlier. The data strongly suggests that the chief reason for decline in the Town's population has been the significant decline in household size. This has occurred among both those living in the community for some time and those within households moving into Arlington during the census periods.

**EXHIBIT II-2**  
**HOUSEHOLDS IN ARLINGTON**

YEAR	NUMBER	10-YEAR PERCENT INCREASE
1970	17,626	
1980	18,534	5.2%
1990	18,848	1.7%
2000	19,011	0.9%

*FUTURE POPULATION CHANGE*

The Town is projected to continue to lose population based on its recent census history. Projections of future population in Arlington to the year 2010, released in August 1999 by the Massachusetts Institute for Social and Economic Research (MISER), assume a slower natural increase, smaller household sizes and modest in-migration. Revised numbers, based on findings of the 2000 census, are expected some time in the latter part of 2002.

The August 1999 MISER projections are produced by the "Age Specific Cohort Survival" method which takes into account factors of natural increase (births and deaths) as well as net (in or out) migration. The estimates are produced after applying three alternative sets of assumptions about these factors. The net results in terms of the low, mid-range and high projections are summarized in Exhibit II-3.

**EXHIBIT II-3  
POPULATION PROJECTIONS**

	LOW	MID	HIGH
2000 (actual)	42,389	42,389	42,389
2005	38,292	38,776	39,498
2010	35,901	36,647	37,650

**EXHIBIT II-4  
PROJECTED PERCENT INCREASES (DECREASES)**

	LOW	MID	HIGH
2000-2005	-9.6%	-8.5%	-6.8%
2005-2010	-6.2%	-5.5%	-4.7%

The rates of decline in population inherent in the projections, shown in Exhibit II-4, depict a shrinking population consistent with the three previous census counts and primarily represent the impact of declining household sizes. Eventually, however, this downward trend should stabilize. Continued capacity for smaller household sizes is limited. At the same time, Arlington is a desirable, well-located and accessible community with a variety of housing opportunities and should continue to attract families and individuals in the future. Together, these factors indicate that Arlington's population will stabilize at approximately 40,000 persons. This could change if higher densities are permitted in some residential areas, but this is not likely in the foreseeable future.

In the interim, the projected decreases in population should not suggest any less demand for fire services. On the contrary, the number of households (and housing units) are just as much a determinant, perhaps even more so, than the size of Arlington's households. Also, even though many households are smaller, they are comprised more and more of aging individuals and couples who generally place greater demands on fire and emergency services, especially EMS.

*POPULATION AGE DISTRIBUTION*

Census data on age components of the population indicates a trend toward the continuing aging of the Arlington population. Shown below are the data for 1990 and 2000.

**EXHIBIT II-5**  
**AGE COMPOSITION OF THE POPULATION**

	1990 CENSUS		2000 CENSUS	
Under 20	8,321	18.6%	8,284	19.5%
20-44	19,596	43.9%	16,941	40.0%
45-64	8,807	19.7%	10,034	23.7%
65 and older	7,906	17.7%	7,130	16.8%
Total	44,630	100.0%	42,389	100.0%

The table indicates an absolute decline in the composition of younger age groups with a corresponding and relatively larger population between the ages of 45 and 64. The increasingly older population will undoubtedly impose increased demands on EMS services in the future.

**THE ARLINGTON FIRE SERVICES DIVISION**

The Fire Services Division of the Arlington Community Safety Department is a full-service career emergency organization and consists of 86 personnel, including the Director of Fire Services (Fire Chief), five Deputy Fire Chiefs, seven Captains, 11 Lieutenants and 58 firefighters. Administrative staff is located at the Community Safety Building on Mystic Street. The Director, one Deputy Chief assigned to Prevention, and the Captain assigned to Training are housed at Headquarters. Eighty-three uniformed personnel are assigned to operations. Personnel are assigned to one of three fire stations: Headquarters (1 Monument Park), Highland (1007 Massachusetts Avenue), and Park Circle (291 Park Avenue).

**EXHIBIT II-6**  
**FIRE SERVICES DIVISION STAFFING**

RANK	NUMBER OF POSITIONS
Director of Fire Services (Chief)	1
Deputy Chief	5
Captain	7
Lieutenant	15
Firefighter	58

Personnel work a 24-hour work schedule, typical of many fire departments, with 24 hours on-duty followed by 72 hours off-duty. There are four Deputy Chiefs, six Captains, 15 Lieutenants, and 58 firefighters assigned to field units. There were several firefighter vacancies at the time of the study.

There are a minimum of 15 firefighters on-duty daily for each group/shift. Generally, seven firefighters staff the Headquarters Station, five firefighters staff the Highland Station, and three firefighters staff the Park Circle Station. Operations personnel are organized into four groups, or shifts. Generally, six officers are assigned to a group. One Deputy Chief serves as the group commander and there are five company officers. Two groups have two Captains and three Lieutenants assigned, while two groups have one Captain and four Lieutenants assigned. Fifty-three firefighters are assigned to the four groups.

**EXHIBIT II-7**  
**CURRENT DEPLOYMENT OF UNITS  
AND PERSONNEL (MINIMUM STAFFING)**

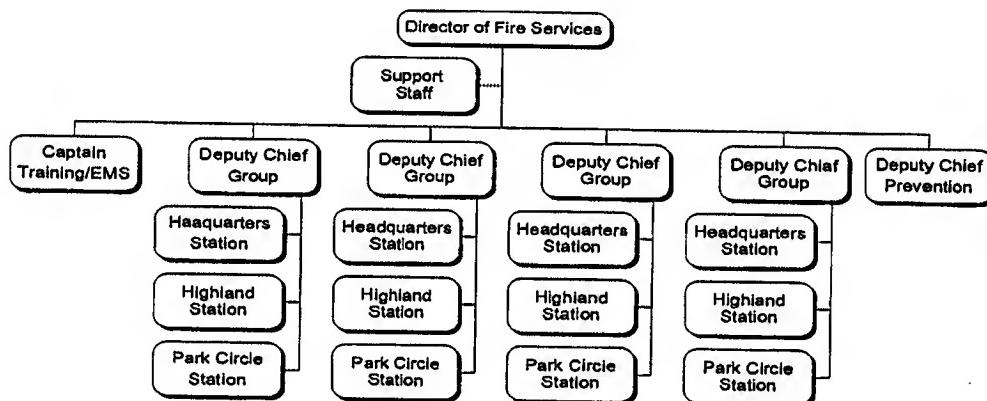
STATION/UNIT	OFFICER	FIREFIGHTER
<i>Headquarters Station</i>		
Deputy Chief	1	
Engine 4	1	2
Ladder 1	1	2
Engine 1	0	0
<i>Highland Station</i>		
Engine 2	1	2
Ladder 2	0	0
Rescue 1	1	1
<i>Park Circle Station</i>		
Engine 3	1	2
<b>Total</b>	<b>6</b>	<b>9</b>

Exhibit II-8, *Current Organization of the Fire Services Division*, indicates that each operations Deputy Chief and the two staff officer positions report to the Director (Fire Chief). The fire prevention Deputy Chief has a range of

responsibilities, including plans review, site inspections, managing the SAFE program and the juvenile fire-setters program, fire investigation and other prevention duties. The Deputy Chief also serves as the safety officer.

The training officer, a Captain, has responsibility for administrative oversight of all field fire and EMS reporting. The training officer is responsible for all division training and training of recruits before they enter the Massachusetts Fire Training Academy. The training Captain serves as the accountability officer during large emergency incidents.

**EXHIBIT II-8  
CURRENT ORGANIZATION OF THE FIRE SERVICES DIVISION**



#### EMERGENCY MEDICAL SERVICES

Emergency Medical Services are delivered in the Town of Arlington through a bifurcated system. Armstrong Ambulance Company (AAC) provides advanced life support (ALS) and the Fire Services Division provides basic life support (BLS). Armstrong Ambulance Company provides a non-transporting vehicle for ALS support and the Division provides a first responder engine or ladder company and a BLS ambulance for patient transport.

All personnel are trained in basic first aid and certified in the use of automatic external defibrillators (AEDs). Sixty personnel are trained and certified at the Emergency Medical Technician-Basic Provider level (EMT-B).

The Fire Services Division performs third-party billing for ambulance transport and the Town retains all reimbursements from BLS transports. AAC is reimbursed by the Town for the ALS support they provide. AAC is committed to maintain at least one ALS vehicle in the vicinity of Arlington for ALS responses and back-up BLS ambulance services; the Fire Services Division normally staffs only one ambulance. Currently, EMS oversight is performed by a field Captain.

*SERVICE RESPONSES*

The Fire Services Division companies make more than more than 7,000 responses each year. Exhibits II-9 and II-10 summarize the Division's responses for service in 2000 and 2001. More than one-half of the Division's responses are for EMS.

**EXHIBIT II-9  
TOTAL FIRE AND EMS RESPONSE**

TYPE OF RESPONSE	2000	2001
Fire Response	3,203	3,628
EMS Responses *	3,934	4,030
Total	7,137	7,658

\* includes multiple company responses

**EXHIBIT II-10  
FIRE AND EMS RESPONSES BY DISTRICT (STATION AREA) 2000 AND 2001**

DISTRICT	2000		2001	
	Fire Response	EMS Response	Fire Response	EMS Response
Headquarters Station				
Engine 4	975	937	1,026	1,027
Engine 1	45	45	51	43
Ladder 1	505	55	668	79
Total	1,525	1,037	1,745	1,149

DISTRICT	2000		2001	
	Fire Response	EMS Response	Fire Response	EMS Response
<i>Highland Station</i>				
Engine 2	838	569	920	640
Ladder 2	132	6	122	15
Rescue 1	353	1,985	407	1,902
Total	1,323	2,560	1,449	2,557
<i>Park Circle Station</i>				
Engine 3	355	337	434	324

#### RELATED SUPPORT FUNCTIONS

Dispatching is the responsibility of the Arlington Police Department through a computer aided dispatch system (CAD). The Fire Services Division has limited capability to access the system. Station computers are networked with Arlington government agencies and e-mail is possible. Fire reports are entered into the computer, but EMS reports are handwritten.

Mutual aid agreements are in place with surrounding communities, but radio communication is poor between mutual aid companies. Mutual aid is utilized for large emergency incidents and station coverage. There is no automatic recall of off-duty firefighters for large emergency incidents. Off-duty Deputy Chiefs are not required to respond to large emergency incidents. The Personal Accountability Officer and the Safety Officer respond to working fires.

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### III. FIRE AND RESCUE OBJECTIVES, BENCHMARKS AND RESPONSE PARAMETERS

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In the evaluation and design of a fire or emergency medical service system, a major consideration is the initial and subsequent response level capability to which the fire and emergency medical service responders should subscribe. As a policy matter, response capability objectives should be established by the Town, with due consideration of practical constraints and financial resources. While containing costs is an important objective, response capabilities and the safety of emergency response personnel must receive every consideration in the equation.

Response capabilities should consider both rapid response and, in the case of fire emergencies, a sufficient number of firefighters to attack the fire. Response time policy, or objectives, must also accommodate variations in fire danger. It is important to consider subsequent responses occurring after the initial response and the possibility of simultaneous emergency events, such as fire, rescue, haz-mat and EMS incidents, occurring during or after the initial incident.

In developing response capability objectives, there are many considerations:

*Containment.* In structure fire instances, there are several important factors to weigh. First is the behavior of fire within a confined space. The risks associated with this can vary across the Town. In closely developed, built-up areas, like Arlington, it is imperative to consistently contain a fire within the compartment of origin (that area separated from the remainder of the structure by construction). This means that the fire department must interrupt the growth of fire before a condition called "flashover" occurs. At flashover, there is a rapid transition in fire behavior from localized burning of fuel, to involvement of all the combustibles in the enclosure. At that time, the fire typically expands in six different directions: vertically through the ceiling, horizontally through the four walls, and even through openings in the floor. By then, all barriers to fire growth beyond the original compartment are under attack by extremely hot flame, smoke and gasses. These elements expand at approximately 50 times their volume per minute. At flashover, the probability of death or serious injury to occupants of the structure is significant. Obviously, life safety within the structure is a basic concern and, when there are nearby

properties involved, the control of flashover becomes even more paramount as additional lives and property are jeopardized.

Comprehensive testing by the United States Institute of Standards and Technology has generally established that a fire within a typically furnished room will evolve into flashover within four to ten minutes of the event of open flame. At that time, temperatures at ceiling level will reach 1,500 degrees. United States fire department planning generally assumes approximately an eight-minute period before flashover.

Under these circumstances, and where lives and properties are in danger, in order to accomplish timely interruption of fire growth, contain the fire within the compartment of origin, and locate and remove threatened persons, rapid and effective response is essential. Fire companies must receive notification of the fire, don appropriate safety gear, mount the apparatus, travel to the scene of the fire, accomplish sufficient firefighting tasks to inhibit fire growth, and rescue occupants within approximately eight minutes of the event of flame. The tasks to be accomplished at the scene by the initial arriving units include search, rescue, ventilation, ladder placement, hose line deployment and other actions, all requiring immediate and simultaneous execution.

*Local Characteristics.* When designing response time and response capability objectives, it is important to consider fire risks, how they vary by neighborhood, and the level of service needed. Risks are greatest in wood-frame and non-resistant residential dwelling units, which are normally without automatic detection and reporting systems or suppression systems. In newer construction (particularly commercial, industrial and institutional structures), where buildings may be required to have automatic detection and suppression systems, the fire risk can be less. The latter usually have suppression systems which reduce the unmeasured time between the start of a fire and when the fire is detected and reported, and automatically retard fire development.

In bringing firefighters to the point of "fire interruption," required steps include:

- Notification of the fire companies
- Turnout of firefighters (donning safety gear, etc.) and dispatch
- Travel time
- Size-up and set-up at the scene

The time required to complete these procedures must be reduced to the shortest possible span through training, sound standard operating procedures, reasonable response times and other means.

Assuming the shortest possible response time for these processes, in most structure fires, the first-due company has very limited time to travel to the incident location and accomplish interruption of fire growth, perhaps no more than four to six minutes. Ideally, the locations of stations should ensure that travel times of four to six minutes can be accomplished in most of the response area surrounding the station, so that the initial response can arrive in time to prevent flashover. Analysis indicates that Arlington is able to meet these response time benchmarks.

The Insurance Services Office (ISO) has established some general station location standards, based on road travel distances. The ISO Fire Suppression Rating Schedule states in item #560, Distribution of Companies: The built-upon area of the Town should have a first-due engine company within 1.5 miles and a ladder-service company within 2.5 miles. The *National Fire Protection Association (NFPA) Handbook* indicates that first-due apparatus should be located within two miles of residential areas, within one and one-half miles of commercial areas and within one mile of locations where the required fire flow exceeds 5,000 gpm. In Arlington, current deployment of engines and ladder companies achieves these ISO standards. Variations in these distances may be specified; the distances, of course, are surrogates for travel times. An illustration of response time in relation to miles is shown in Exhibit III-1.

**EXHIBIT III-1**  
**MINUTES AT VARIOUS SPEEDS AND DISTANCES**

AVERAGE SPEED	MINUTES TO COVER ISO DISTANCE OF:		
	1.5 miles	2.5 miles	5.0 miles
18 mph	5.0	8.3	16.7
20 mph	4.5	7.5	15.0
22 mph	4.1	6.8	13.6
25 mph	3.6	6.0	12.0
30 mph	3.0	5.0	10

*Distribution of Capacity.* The basic principle for allocation of fire suppression forces is to distribute units throughout the service area, to allow approximately equal travel distances and response times to all locations. In Arlington, current fire station locations allow the dispatch of companies to effectively cover their individual response areas within reasonable time frames. However, factors other than distance will influence response. For instance, weather conditions, the configuration of the roadway network, topography, or traffic patterns may delay response. Taking these factors into account, therefore, each protection area must set its own realistic goal, such as reaching 80 or 90 percent of the incidents within an identified number of minutes.

*EMS Response Considerations.* The benchmark for fire interruption is also important for emergency medical response purposes. Survivability for a non-breathing person is a function of application of CPR, defibrillation, and advanced life support. Models exist to predict survivability. One commonly applied model is the Eisenberg Model, which estimates the probability of survival based on a system's ability to deliver the critical links in a timely manner. The functional equation is:

$$\begin{aligned} \text{Survival rate} = & 67\% \text{ minus } 2.3\% \text{ per minute without CPR} \\ & \text{minus } 1.1\% \text{ without necessary defibrillation} \\ & \text{minus } 2.1\% \text{ per minute without necessary Advanced Cardiac Life Support} \end{aligned}$$

This equation suggests that one-third of all non-breathing and/or cardiac arrest patients may die immediately, and that the remaining individuals' probability of survival decreases by up to 5.5 percent for each subsequent minute; however, the decrease can be slowed by the application of various procedures (CPR, defibrillation, ACLS).

*AHA Standard* Based on this equation, and their own observations and experiences, the American Heart Association recommends a maximum response time of four minutes for initiation of Basic Life Support (BLS) and eight minutes and 59 seconds for initiation of ALS.

*Personnel and Apparatus Deployment Factors.* For a working fire, the minimum apparatus should be two engines and one ladder. NFPA Standard 1710 indicates that 15 firefighters, including an incident commander, are required at a low-hazard structure fire. National Fire Protection Association (NFPA) Standard 1710, approved on August 2, 2001, sets forth requirements concerning the organization of fire suppression and fire-based EMS services, as

well as staffing requirements and maximum response times to fire and EMS incidents. While NFPA standards do not have the weight of law, unless adopted by municipal law, imposed by the authority having jurisdiction (AHJ), or required by OSHA or the Code of Federal Regulations, standards are typically viewed by as "industry standards." The consultants recommend that the relevant provisions of NFPA Standard 1710 be taken into careful consideration by Town decision makers, with the understanding that the 1710 "equivalency" clause (Section 1.3) allows for "... the use of systems, methods, or approaches of equivalent or superior performance than those prescribed in the standard." The provisions of NFPA Standard 1710 which are most relevant to the Fire Services Division are indicated below.

**EXHIBIT III-2**  
-- NFPA STANDARD 1710

<b>SECTION</b>	<b>SUMMARY OF GENERAL SUBJECT MATTER SECTIONS</b>
4.3.2	Fire Department EMS capability includes personnel, equipment, defibrillator
4.3.2.1	Authority Having Jurisdiction sets requirements for any other EMS agency in the Town
5.2.1.2.1	Sufficient fire company staffing for safe operations
5.2.1.2.2	Each fire company has an officer
5.2.1.2.3	Chief level officer to all full alarms
5.2.2.1.1	Engine companies staffed with minimum of 4
5.2.2.2.1	Ladder companies staffed with minimum of 4
5.2.3.1.1	First-due engine to arrive within 240 seconds running time and/or full first alarm assignment within 480 seconds running time, to 90% of incidents
5.2.3.2.2	The initial full alarm assignment shall consist of 14 individuals, or 15 if an aerial ladder has responded
5.3.3.4.2	Fire department first responder shall arrive within a 4-minute response time to 90% of the incidents

It is also important to consider the so-called "two in, two out" OSHA guideline that, except in extreme life-threatening situations to the occupants, four firefighters will be required at the scene of a structure fire before any two may enter. The following are four emerging standards, or benchmarks which affect crew size desired for a fire call:

1. *OSHA requirements* for a minimum of four equipped personnel to be present before entry in a structure fire incident
2. *OSHA requirements* for a rapid intervention team (RIT) to be present for safety reasons at working structure fires
3. *OSHA and NFPA requirements* for a qualified incident commander and a qualified safety officer to be present at working incidents
4. *Industry standards* to have a minimum number of firefighters and an incident commander present for a low-hazard structure fire, plus at least two pumper and a ladder truck, or similar vehicle

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## IV. COMPUTER MAPPING AND STATION LOCATION EVALUATION

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### MAPPING METHODOLOGY

Response coverage provided by the existing fire stations in Arlington was analyzed using the consultant's computer mapping capabilities. The model analyzes the travel times that can be attained from apparatus from each fire station responding to its surrounding area. The maps illustrate the parts of the Town that can be reached within one, two, three and four minutes travel time from a fire station. Stations include One Monument Park (Station 1, Headquarters Station), 1007 Massachusetts Avenue (Station 2, Highland Station) and Park Circle (Station 3). The computer mapping model examined the existing three-station system and a two-station alternative configuration, which would maintain the Headquarters and Highland Stations, while closing the Park Circle station. In addition, an alternative three-station configuration was examined which assumed stations at One Monument Park (Station 1, Headquarters Station), 1007 Massachusetts Avenue (Station 2, Highland Station) and a new station at Poet's Corner.

The mapping methodology includes several steps:

1. Preparing a digitized base map representation of the Arlington street and highway network.
2. Locating the fire stations to be analyzed with respect to that network.
3. Reviewing the topography of the Town, particularly in the Arlington Heights section.
4. Assigning average speeds to the various types of streets in the Town and adjusting speeds for streets, or sections of streets, in the Heights area influenced by steep gradients.
5. Generating color-coded maps indicating travel times from the fire stations in one-minute intervals to the borders of the community.

The street network is based on TIGER files updated to 1998 for the U.S. Census. Upon examination of the TIGER files, a few street connections required editing, e.g., extending Wollaston Street to the south, adding some connections for missing sections of Route 2, and providing a street connection under Route 2 to the Arlmont section of the Town. The resulting digitized street

network was used in the computer mapping analysis to determine travel times to various points in the Town from the different fire stations. In order to do this, the longitude and latitude locations of the fire stations were layered on the street network and speed assignments were made.

Because the digitized streets, or street sections, are reported in lengths (fractions of a mile), they were converted into time segments for the purposes of the analysis. This was done by assigning reasonable average speeds for the different types of streets and making some adjustments for steeper street segments. These speed assignments were made based on discussions with Town officials and on-site inspection by consultants.

All streets first received a basic average speed assignment, depending on their function as a major highway (Route 2), a major thoroughfare, such as Massachusetts Avenue, a collector street, or a minor local street. The basic speed assignments used are listed in Exhibit IV-1.

**EXHIBIT IV-1**  
**STREET SPEED ASSUMPTIONS**

**SPEED \*      ARLINGTON STREETS/HIGHWAYS**

50 mph    Massachusetts Route 2

40 mph    Massachusetts Avenue, Broadway, Mystic Valley Parkway

35 mph    Mystic Street, Summer Street, Pleasant Street, Medford Street, Warren Street, Ridge Street, Washington Street

30 mph    Park Avenue, Gray Street, Eastern Avenue, Highland Avenue, Lake Street

20 mph    All others (local streets)

\* *Adjustments for some steep gradients in the Arlington Heights area were also made for sections of Park Avenue, Highland Avenue, etc*

On all streets, conservative average speeds were used in order to take into account many different limiting factors, such as time of day, season of the year, weather, traffic, etc. The assumed speeds should allow for these less than ideal conditions. It is quite possible that many times, because of favorable conditions, speeds higher than these will occur.

Because topography was considered to have a stronger influence in some specific areas, especially in the Park Circle area, additional adjustments were made to the speed assignments for some streets. A member of the consulting team drove the Arlington Heights area with the Fire Chief, noting where steep gradients could tend to reduce fire engine and ladder truck speed capabilities. Other parts of the Town, though hilly, were not considered to have the same constraints as in the Heights section, where the gradients are sharper and more severe. The on-site evaluation was further supplemented by the consultants' use of topographic mapping software to review street profiles and the average grades of street sections.

Street gradients of three percent or less were not considered a factor influencing speed. Gradients of four to seven percent were assumed to result in an average speed of 15 miles per hour for fire apparatus; grades of eight percent or greater could be expected to reduce speed to 10 miles per hour, on the average. These rather conservative speed assumptions were allocated to street sections in the Arlington Heights area, as appropriate, and adjustments were entered in the digitized street network.

The adjustments for steep gradients in the Heights section of Arlington are listed in Exhibit IV-2. Emergency apparatus normally cannot attain very high speeds on these sections of streets; this is particularly true during slippery conditions, even using chains.

**EXHIBIT IV-2**  
**STREET SEGMENTS SPEED ADJUSTMENTS BASED ON STREET GRADIENT**

STREET	SPEED ASSIGNED	FROM INTERSECTION WITH:	TO INTERSECTION WITH:
Appleton St.	15 mph	Massachusetts Ave.	Oakland Ave.
Appleton St.	10 mph	Hillside Ave.	Claremont St.
Appleton St.	15 mph	Claremont St.	Wachusett Ave.
Park Ave.	15 mph	Massachusetts Ave.	Wollaston Ave.
Park Ave.	15 mph	Wollaston Ave.	Appleton St.
Park Ave.	10 mph	Appleton St.	Florence Ave.
Wollaston Ave.	15 mph	Hillside Ave.	Claremont St.
Wollaston Ave.	10 mph	Claremont St.	Wachusett Ave.
Hillside Ave.	15 mph	Wollaston Ave.	Appleton St.

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STREET	SPEED ASSIGNED	FROM INTERSECTION WITH:	TO INTERSECTION WITH:
Hillside Ave.	15 mph	Appleton St.	Florence Ave.
Hillside Ave.	15 mph	Florence Ave.	Oakland Ave.
Claremont Ave.	15 mph	Wollaston Ave.	Appleton St.
Claremont Ave.	15 mph	Appleton St.	Florence Ave.
Wachusett Ave.	15 mph	Wollaston Ave.	Appleton St.
Florence Ave.	10 mph	Appleton St.	Park Ave.
Florence Ave.	15 mph	Hillside Ave.	Claremont St.
Oakland Ave.	10 mph	Appleton St.	Gray St.
Oakland Ave.	15 mph	Gray St.	Park Ave.
Quincy St.	10 mph	Appleton Place	Gray St.
Fountain Road	10 mph	Gray St.	Spring Ave.
Fountain Road	15 mph	Spring Ave.	Hawthorne Ave.
Robbins Road	15 mph	Massachusetts Ave.	Howard St.
Robbins Road	10 mph	Howard St.	Gray St.
Robbins Road	10 mph	Gray St.	Spring Ave.
Robbins Road	15 mph	Spring Ave.	Hawthorne Ave.
School St.	10 mph	Menotomy Way	Gray St.
Kenilworth Road	10 mph	Gray St.	Spring Ave.
Menotomy Road	15 mph	Massachusetts Ave.	Revere St.
Menotomy Road	10 mph	Gray St.	Spring Ave.
Grand View Ave.	15 mph	Massachusetts Ave.	Revere St.
Grand View Ave.	10 mph	Gray St.	Spring Ave.
Walnut St.	15 mph	Massachusetts Ave.	Revere St.
Walnut St.	10 mph	Gray St.	Spring Ave.
Walnut Terrace	10 mph	Walnut St.	Gray St.
Pine Ridge Road	10 mph	Gray St	Spring Ave.
Pine Ridge Road	15 mph	Spring Ave.	Hawthorne Ave.
Puritan Road	15 mph	Spring Ave.	Hawthorne Ave.
Stephens Terrace	15 mph	Gray St.	Hawthorne Ave.
Coolidge Road	15 mph	Gray St.	Hawthorne Ave.
Mt. Vernon St.	15 mph	Massachusetts Ave.	Albermarle St.
Mt. Vernon St.	10 mph	Albermarle St.	Gray St.

STREET	SPEED ASSIGNED	FROM INTERSECTION WITH:	TO INTERSECTION WITH:
Mt. Vernon St.	15 mph	Gray St.	Hawthorne Ave.
Coleman Rd.	15 mph	Massachusetts Ave.	Moulton Road
Highland Ave.	15 mph	Wildwood Ave.	Gloucester St.
Highland Ave.	15 mph	Gloucester St.	Gray St.
Highland Ave.	15 mph	Gray St.	Hawthorne Ave.
Scituate St.	15 mph	Gloucester St.	Gray St.
Scituate St.	15 mph	Gray St.	Spring Ave.
Newport St.	15 mph	Gloucester St.	Gray St.
Newport St.	15 mph	Gray St.	Spring Ave.

#### COMPUTER GENERATED MAPS

Based on the analysis, three travel time maps were developed. Two maps were developed for the Town showing the areas covered from the existing fire stations within one, two, three and four minutes of a station. A third map was developed showing a three-station response system with a new station located in the Poet's Corner area. The maps indicate travel times for the first-in capabilities of the fire and emergency response system. It should be noted that the maps illustrate only the travel component of the response system. The initial dispatch, get-out, size-up and set-up times must be added. In order to allow ample time for these components, a travel time of *four minutes or less* is most desirable. This will allow the emergency fire response system to be on-scene and ready to operate before "flashover," which is generally accepted to occur within eight minutes of initial discovery of a structure fire. It also provides sufficient time for EMS personnel to arrive within eight minutes and 59 seconds of first notification of a life-threatening situation.

The maps only depict over-the-road travel, or running, times. Two minutes for notification, dispatch, and turn-out time should be added to these times for an estimate of total response time. This will provide a conservative estimate of response capability.

The color-coded maps show those areas within the community that are generally able to be reached from a fire station within one minute (green), between one and two minutes (purple), two and three minutes (blue), and three and four minutes (pink).

*Map 1, Travel Time from Three Stations*, shows the existing system of three fire stations and the travel times to various parts of the Town, based on the average speeds discussed previously. The central band (green area) shows a strong linear pattern related to Massachusetts Avenue and the fact that two stations are located on this main thoroughfare. Together with the purple and blue areas, most of Arlington is within reach of a fire station within three minutes, and all within four minutes.

*Map 2, Travel Time from Two Stations*, illustrates what could be expected if two stations are operational and the third (Park Circle) is decommissioned. The one-minute response around the Park Circle Station disappears; the two-minute area (purple) is somewhat smaller; and the three and four-minute response areas (blue and pink) are somewhat larger than in Map 1. The numerical results of these two systems are reported in the following section, specifying the areas covered, the street miles and the population of the Town within one to four minutes of a fire station, as depicted in each of the two maps.

#### **RESPONSE COVERAGE DATA (CURRENT STATION SYSTEM)**

Maps 1 and 2 illustrate the travel component of response times when traveling to various parts of Arlington from the existing three stations and for a two-station alternative. For this analysis, consultants have translated the computer maps into statistical measures. These measures indicate the square miles, total street mileage, and the total 2000 population components that fall within each of the colored areas on the maps. While there is some tradeoff between a three-station and a two-station system in terms of the shortest travel times to some areas (one to two minutes), the Town can still be covered in a two-station alternative within four minutes (five to six minutes total response time).

Exhibit IV-3 shows the square miles, percent of square miles covered and the cumulative percent of coverage in time intervals of under one minute, one to two minutes, two to three minutes and three to four minutes. The exhibit compares the current three-station model with a two-station configuration. For example, within three minutes, the Fire Services Division has the capability of reaching 97.8 percent of the area of the Town, while in the two-station configuration, 95.1 percent of the area of the Town is reached. However, within

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four minutes (within five to six minutes total response time), 100 percent of the area of the Town is covered in two and three station configurations.

**EXHIBIT IV-3**  
**TRAVEL TIME SEGMENTS FROM CURRENT FIRE STATIONS**  
**SQUARE MILES COVERED**

TIME INTERVAL	THREE-STATION COVERAGE			TWO-STATION COVERAGE		
	Sq. Mi.	Percent	Cumulative %	Sq. Mi.	Percent	Cumulative %
Under 1 minute	1.98	33.3%		1.75	29.5%	
1 to 2 minutes	2.72	45.8%	79.1%	2.29	38.6%	68.1%
2 to 3 minutes	1.11	18.7%	97.8%	1.61	27.1%	95.1%
3 to 4 minutes	.13	2.2%	100.0%	.29	4.9%	100.0%
Total	5.94	100.0%		5.94	100.0%	

Exhibit IV-4 shows the street miles, percent of street miles covered and the cumulative percent of coverage of street miles in time intervals of under one minute, one to two minutes, two to three minutes and three to four minutes. The exhibit compares the current three-station model with a two-station configuration. Within three minutes travel time, or five minutes total response time, the Division has the capability of reaching 98 percent of the street miles within the Town, while the two-station configuration has the capability of reaching 96 percent of the street miles within the Town.

**EXHIBIT IV-4**  
**TRAVEL TIME FROM CURRENT FIRE STATIONS**  
**STREET MILES COVERED**

TIME INTERVAL	THREE-STATION COVERAGE			TWO-STATION COVERAGE		
	Street Mi.	Percent	Cumulative %	Street Mi.	Percent	Cumulative %
Under 1 minute	49.8	38.8%		43.9	34.1%	
1 to 2 minutes	56.9	44.3%	83.1%	49.3	38.3%	72.4%
2 to 3 minutes	19.4	15.1%	98.2%	30.3	23.6%	96.0%
3 to 4 minutes	2.5	1.9%	100.0	5.1	4.0%	100.0%
Total	128.5	100.0%		128.6	100.0%	

Exhibit IV-5 is organized in the same manner as Exhibits IV-3 and IV-4 and shows population served in intervals of under one minute, one to two minutes, two to three minutes and three to four minutes. Within three minutes (five minutes total response time), the Division has the capability of covering 98.5 percent of the Town's population; in the two-station configuration, 96.6 percent of the Town's population is covered.

**EXHIBIT IV-5**  
**TRAVEL TIME FROM CURRENT FIRE STATIONS**  
**PERCENT OF POPULATION SERVED IN TIME SEGMENTS**

TIME INTERVAL	THREE-STATION COVERAGE			TWO-STATION COVERAGE		
	<i>Est. 2000 Pop.</i>	<i>Percent</i>	<i>Cum. %</i>	<i>Est. 2000 Pop.</i>	<i>Percent</i>	<i>Cum. %</i>
Under 1 minute	17,337	40.9%		15,090	35.6%	
1 to 2 minutes	18,990	44.8%	85.7%	16,405	38.7%	74.4%
2 to 3 minutes	5,426	12.8%	98.5%	9,410	22.2%	96.6%
3 to 4 minutes	636	1.5%	100.0%	1,484	3.5%	100.0%
Total	42,389	100.0%		42,389	100.0%	

**RESPONSE COVERAGE DATA (ALTERNATIVE THREE-STATION SYSTEM)**

At the request of the Town, consultants also examined the impact of operating with a three-station configuration. Under this alternative model, a new fire station would be located in the Poet's Corner area, to support the current stations at One Monument Park (Station 1, Headquarters Station) and 1007 Massachusetts Avenue (Station 2, Highland Station).

*Map 3, Travel Time from Two Existing and Alternative Third Station,* shows the travel component of response times to various parts of Arlington from two existing stations and a relocated fire station. Consultants have translated the computer maps into statistical measures, in the same manner as shown for Maps 1 and 2.

Exhibit IV-6 compares the current three fire station configuration with an alternative three fire station configuration. The exhibit shows the street miles, percent of street miles covered and the cumulative percent of coverage

of street miles in travel time intervals of under one minute, one to two minutes, two to three minutes and three to four minutes. Coverage is similar in both models.

**EXHIBIT IV-6**  
**TRAVEL TIME FROM CURRENT THREE FIRE STATIONS AND THREE-STATION ALTERNATIVE  
STREET MILES COVERED**

TIME INTERVAL	CURRENT THREE-STATION COVERAGE			THREE-STATION COVERAGE (ALTERNATIVE)		
	Street Mi.	Percent	Cumulative %	Street Mi.	Percent	Cumulative %
Under 1 minute	49.8	38.8%		48.6	37.8%	
1 to 2 minutes	56.9	44.3%	83.1%	54.5	42.4%	80.2%
2 to 3 minutes	19.35	15.1%	98.2%	24.6	19.1%	99.3%
3 to 4 minutes	2.45	1.9%	100.0%	0.8	0.6%	100.0%
Total	128.5	100.0%		128.5	100.0%	

Exhibit IV-7 shows the square miles, percent of square miles covered and the cumulative percent of coverage in time intervals of under one minute, one to two minutes, two to three minutes and three to four minutes. The exhibit compares the current three-station model with the alternative three-station configuration. Coverage is similar in both configurations.

**EXHIBIT IV-7**  
**TRAVEL TIME FROM CURRENT THREE FIRE STATIONS  
AND THREE-STATION ALTERNATIVE COMPARED  
SQUARE MILES COVERED**

TIME INTERVAL	THREE-STATION COVERAGE			THREE-STATION COVERAGE (ALTERNATIVE)		
	Sq. Mi.	Percent	Cumulative %	Sq. Mi.	Percent	Cumulative %
Under 1 minute	1.98	33.3%		1.96	32.9%	
1 to 2 minutes	2.72	45.8%	79.1%	2.66	44.7%	77.6%
2 to 3 minutes	1.11	18.7%	97.8%	1.3	21.8%	99.4%
3 to 4 minutes	.13	2.2%	100.0%	.03	0.5%	100.0%
Total	5.94	100.0%		5.95	100.0%	

Exhibit IV-8 is organized in the same manner as Exhibits IV-6 and IV-7 and shows population served in intervals of under one minute, one to two minutes, two to three minutes and three to four minutes. The exhibit compares the current three-station model with the alternative three-station configuration. Coverage is similar in both configurations.

**EXHIBIT IV-8**  
**TRAVEL TIME FROM THREE FIRE STATIONS - CURRENT AND ALTERNATIVE**  
**PERCENT OF POPULATION SERVED IN TIME SEGMENTS**

TIME INTERVAL	THREE-STATION COVERAGE			THREE-STATION COVERAGE (ALTERNATIVE)		
	Est. 2000 Pop.	Percent	Cum. %	Est. 2000 Pop.	Percent	Cum. %
Under 1 minute	17,337	40.9%		16,277	38.4%	
1 to 2 minutes	18,990	44.8%	85.7%	18,142	42.8%	81.2%
2 to 3 minutes	5,426	12.8%	98.5%	7,800	18.4%	99.6%
3 to 4 minutes	636	1.5%	100.0%	170	0.4%	100.0%
Total	42,389	100.0%		42,389	100.0%	

Exhibit IV-9 provides a summary of the data from the three maps.

**EXHIBIT IV-9**  
**COMPARISON OF EXISTING THREE STATIONS, ALTERNATIVE THREE-STATION CONFIGURATION**  
**AND TWO-STATION CONFIGURATION**  
**PERCENT OF POPULATION SERVED & STREET MILES COVERED IN TIME SEGMENTS**

TIME INTERVAL	PERCENT OF POPULATION COVERED			PERCENT OF STREET MILES COVERED		
	Current 3 Stations	Alternative 3 Stations	2 Stations	Current 3 Stations	Alternative 3 Stations	2 Stations
Under 1 minute	40.9%	38.4%	35.6%	38.8%	37.8%	34.1%
1 to 2 minutes	44.8%	42.8%	38.8%	44.3%	42.4%	38.3%
2 to 3 minutes	12.8%	18.4%	22.2%	15.1%	19.1%	23.6%
3 to 4 minutes	1.5%	0.4%	3.5%	1.9%	0.6%	4.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

The data indicates that the Town can be well covered with a two-station configuration, and while there is some tradeoff between a three and a two station system in terms of the fastest travel times to some areas (one to two

minutes), the two-station configuration offers very good response capability and exceeds desirable standards. It is important to note that the mapping is consistent with the response times noted by the Division. The average response time for structure fires, as reported by the Division, are: three minutes and 15 seconds from Headquarters, three minutes and 30 seconds from Highland and three minutes from Park Circle.

The two-station deployment configuration allows the Fire Services Division to meet benchmarks and standards. The data indicates that:

- A two-station configuration enables an engine company to arrive at the scene of a fire incident within four minutes travel time 100 percent of the time.
- A two-station configuration provides for a response system in which personnel can respond rapidly with first-in attack capability.
- A two-station configuration enables the delivery of a full alarm assignment to a structure fire within eight minutes.
- A two-station configuration enables an EMS first responder company to be on scene 100 percent of the time within four minutes.
- The removal of the Park Circle Station does not require the relocation of other fire stations.
- Headquarters and Highland Stations are well located to provide effective fire and emergency medical response.
- An alternative three-station configuration (placement of a relocated station in the Poet's Corner area) does not offer any significant improvement over the current three-station configuration, or the proposed two-station configuration.
- Committing financial resources to reconstruction of the Park Circle Station, or construction of a new station, would not be the most effective use of resources; committing resources to maintaining Headquarters and Highland Stations is a more effective use of resources.

**RECOMMENDATION IV-1: *The Town should decommission the Park Circle Fire Station.***

**RECOMMENDATION IV-2: *The Town should provide fire and rescue services using a two fire station configuration.***

**RECOMMENDATION IV-3: *Headquarters and Highland Stations should be retained as the base of operations for a two-station response system.***

#### **FIRE STATION LOCATION SITE AND RELATED FACTORS**

In addition to evaluating current fire station locations using time and distance measures, there are other variables to consider, including entrances and exits as they may relate to the traffic flow on adjacent thoroughfares, street and roadway patterns and intersections in the area, response speeds capable of being achieved, fire incident demand patterns, weather conditions, traffic density, road grades, response time of additional apparatus, availability of adequate land, and finances. Computer mapping indicates that the Headquarters and Highland Stations are well located. These current locations allow for the dispersal of units throughout the service area and provide approximately equal travel distances and response times to all locations.

In addition to general location factors, there are many site specific considerations that are reviewed when selecting a location. As seen from the following list of general site location factors, Headquarters and Highland Stations meet many of these general location factors.

- Access to street from ramp or driveway going in either direction and to main travel routes
- Site drainage, flooding potential
- Subsoil stability and carrying capacity
- Grade, levelness of site and approaches
- Good sight lines in all directions
- Drive-through capabilities
- Natural barriers, positive and negative aspects
- Artificial barriers, bridges, etc.
- Actual traffic conditions
- Surrounding traffic speed
- Time of day or day of week problems
- Traffic control devices now, or needed in the future
- Pedestrian traffic
- Curb cut approvals
- Possible ramp length
- Weight, width, height restrictions of approaches
- Noise restrictions
- Audible alarms and siren problems
- Antenna height possible
- Utilities available

- Height and other building restrictions
- Multi-story structure possible
- Fuel dispenser possible
- Training facilities possible
- Compatibility with existing neighborhood
- Future growth in the surrounding area
- Incompatible nearby uses
- Community meeting facility possible
- Additional community services possible
- Historical area restrictions or considerations
- Neighborhood response

On the following pages, three computer maps are presented:

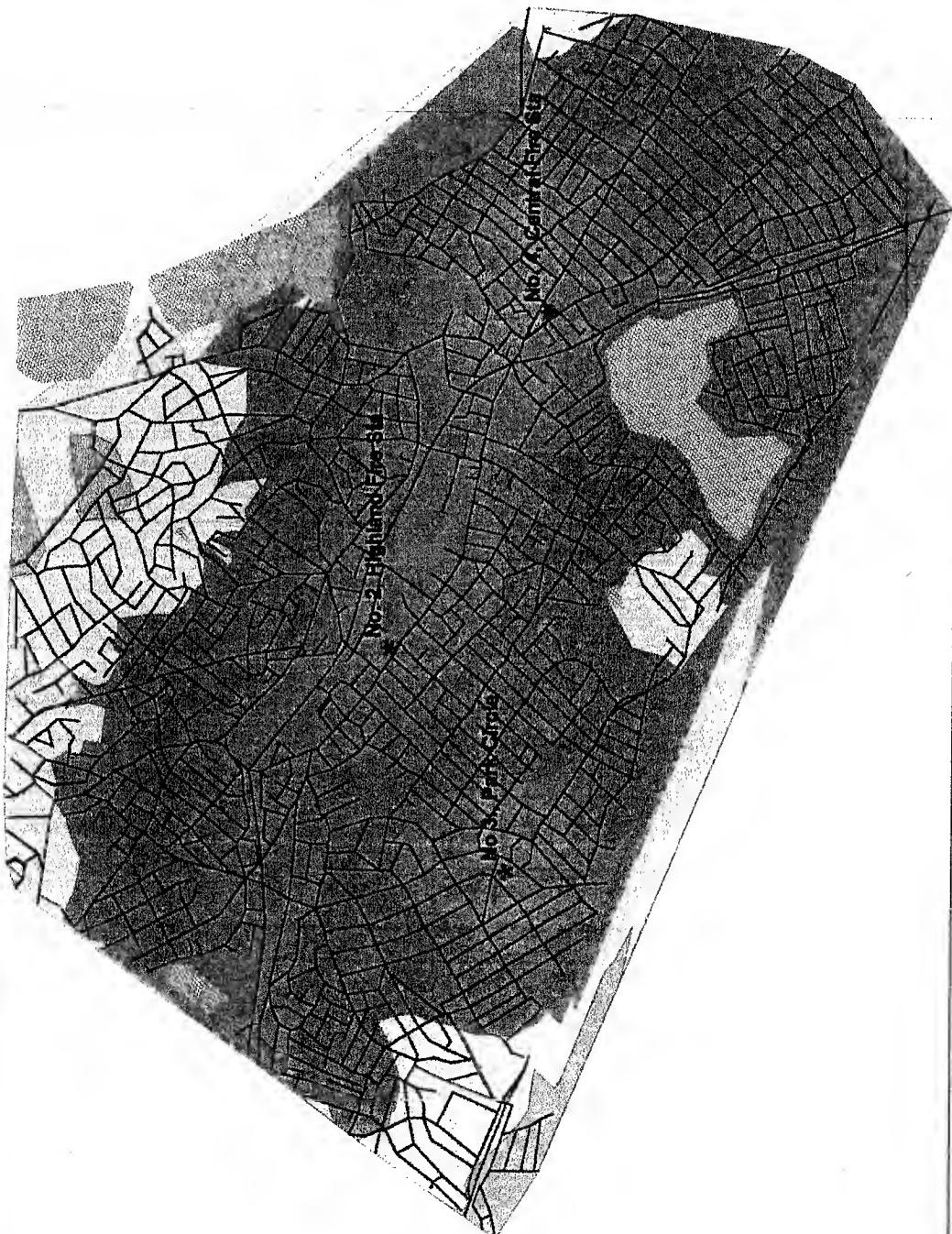
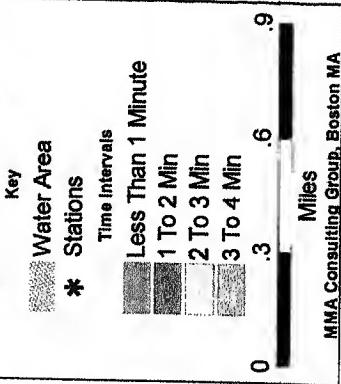
*Map 1, Travel Time from Three Stations*

*Map 2, Travel Time from Two Stations*

*Map 3, Travel Time from Two Existing and Alternative Third Station*

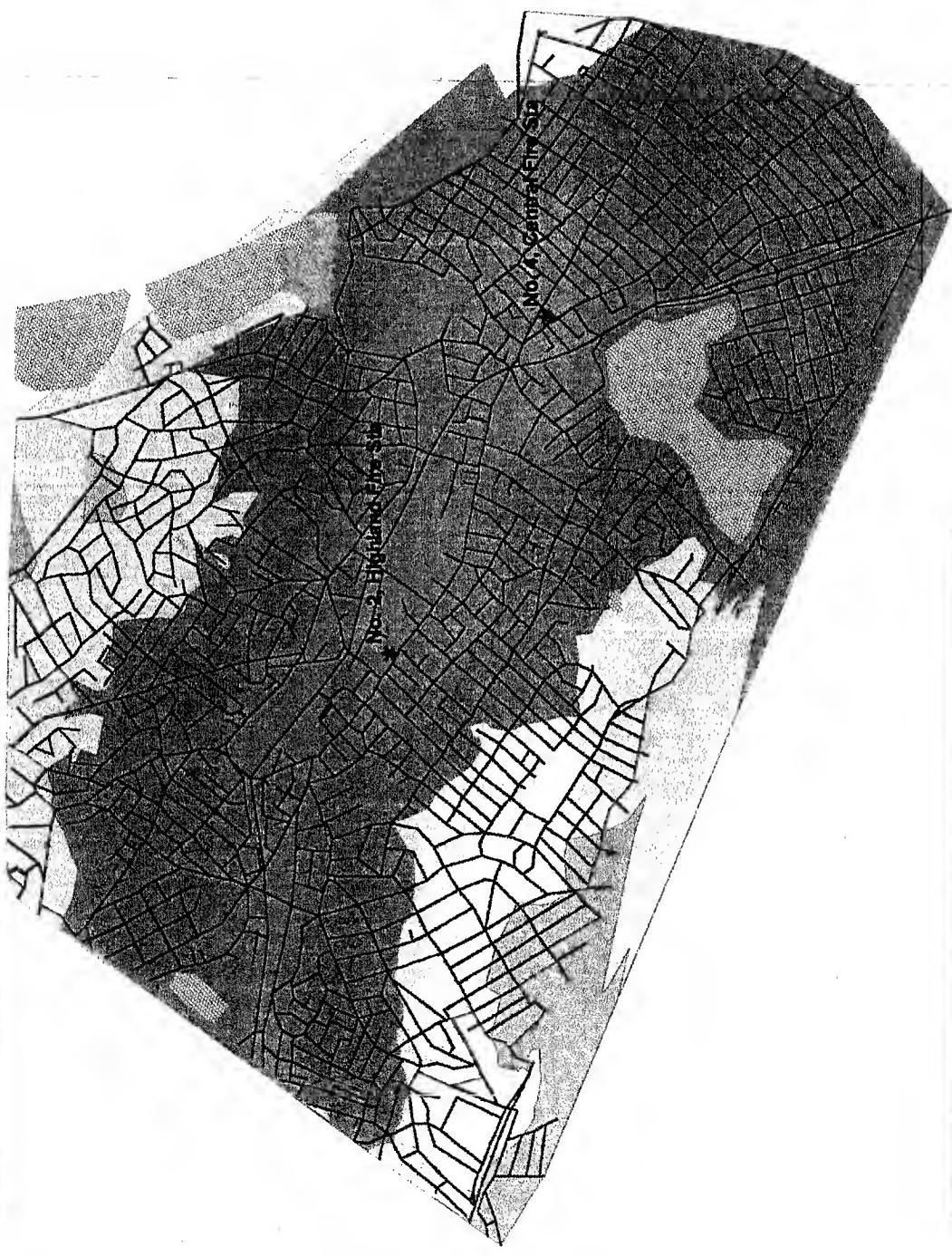
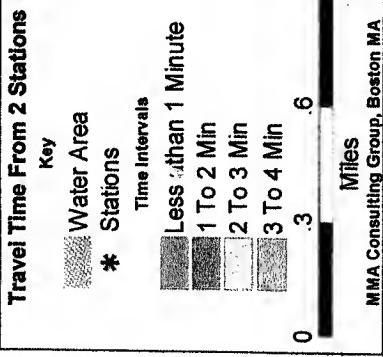
# MAP 1

## Travel Time From 3 Stations



MMA Consulting Group, Boston MA

## MAP 2

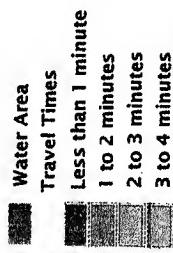


MMA Consulting Group, Boston MA

**MAP 3**

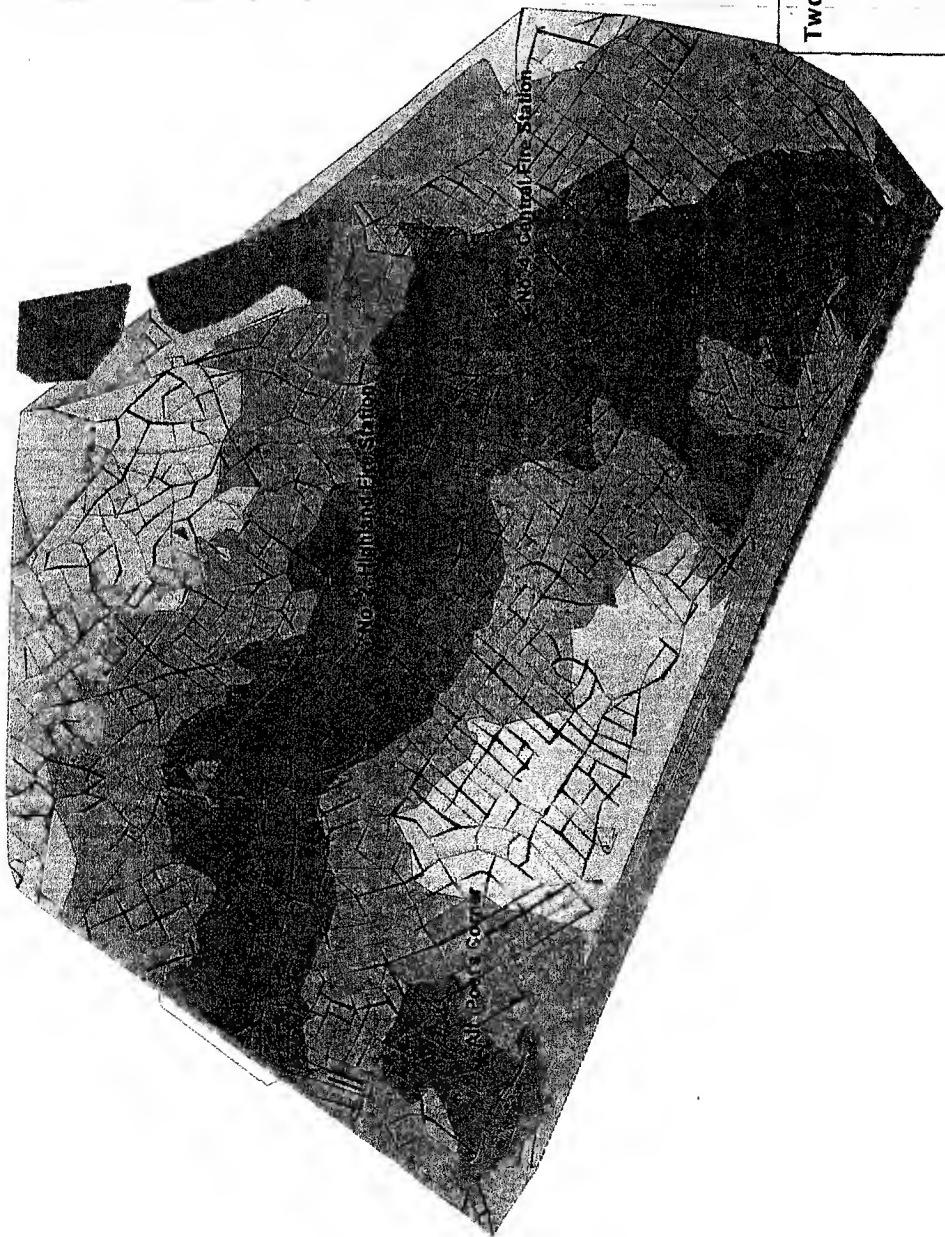
**Two Existing and Alt Third Station**

**Station Locations**



0 .8 1.2  
Miles

MMA Consulting Group, Inc.



## V. DEPLOYMENT AND ORGANIZATION

The development of a two fire station response configuration requires a change in the deployment of personnel and the organization of the Division. The current organization and staffing model provides emergency response personnel, but it does not address important management and planning functions.

### CURRENT DEPLOYMENT APPROACH

The current three-station configuration results in the deployment of a minimum of 15 firefighters daily, which allows for the staffing of three pumpers, a ladder, and a rescue (ambulance).

**EXHIBIT V-1  
CURRENT DAILY STAFFING DEPLOYMENT  
(MINIMUM OF 15 ON-DUTY PERSONNEL)**

<i>Headquarters Station</i>		<i>Highland Station</i>		<i>Park Circle Station</i>	
	<b>NUMBER OF FIREFIGHTERS</b>		<b>NUMBER OF FIREFIGHTERS</b>		<b>NUMBER OF FIREFIGHTERS</b>
Deputy Chief	1				
Engine 4	3	Engine 2	3	Engine 3	3
Engine 1	0	Ladder 2	0		
Ladder 1	3	Rescue 1 (Ambulance)	2		
<b>Total</b>	<b>7</b>		<b>5</b>		<b>3</b>

Redeployment of personnel becomes necessary with the closure of the Park Circle Fire Station and the movement toward operating with a two fire station configuration. The Division currently operates with a minimum of 15 persons on duty, which allows the Division to meet the response standards and general benchmarks shown in Chapter III of this report. (For a working fire, the minimum apparatus should be two engines, one ladder and ten, preferably 12, firefighters, including an incident commander.) This minimum number should be maintained.

Two deployment plans are presented below. To implement either of the two final deployment plans, it will be necessary to engage in a period of transition and implement an initial deployment strategy with the closing of the Park Circle Station. The initial redeployment model should be implemented as soon as possible, and the final deployment model should be implemented over the next several years. Ideally, redeployment Option 2 is the most desirable plan.

*The Initial Redeployment Plan should include:*

- the decommissioning of the Park Circle Station
- the initial re-assignment of personnel to Highland Station to allow for staffing of Engine 2 with three personnel, Ladder 2 with three personnel and Rescue 1 with two personnel, for a total of eight personnel
- minimum staffing of seven at Headquarters Station

*The Final Redeployment Plan (Option 1) should include:*

- the purchase of a quint apparatus (aerial with pump capability)
- the assignment of the quint to Highland Station
- the assignment of three personnel to the quint
- the assignment of two personnel to the Rescue at Highland Station, for a total of five personnel at the Highland Station
- the reassignment of three personnel, initially assigned to Highland Station, to Headquarters Station
- the assignment of ten personnel to Headquarters Station to staff Engine 1 with three personnel, Engine 4 with three personnel, Ladder 1 with three personnel, and the Deputy Chief

*The Final Redeployment Plan (Option 2) should include:*

- the purchase of a quint apparatus (aerial with pump capability)
- the assignment of the quint to Highland Station
- the assignment of four personnel to the quint
- the assignment of two personnel to Rescue 1 at Highland Station and the assignment of Rescue 2 to Highland Station (if necessary, the back-up rescue would be staffed by two members of the quint company)
- the assignment of a total of six personnel at the Highland Station

- the reassignment of two personnel, initially assigned to Highland Station, to Headquarters Station
- the assignment of nine personnel to Headquarters Station to staff Engine 4 with four personnel, Ladder 1 with four personnel, and the Deputy Chief

Exhibit V-2 illustrates the *initial* reassignment of personnel.

**EXHIBIT V-2  
INITIAL REDEPLOYMENT  
(MINIMUM OF 15 ON-DUTY PERSONNEL)**

<i>Headquarters Station</i>		<i>Highland Station</i>		<i>Park Circle Station</i>	
	NUMBER OF FIREFIGHTERS		NUMBER OF FIREFIGHTERS		NUMBER OF FIREFIGHTERS
Deputy Chief	1				
Engine 4	3	Engine 2	3	Engine 3	0
Engine 1 Deactivated	0	Ladder 2	3		
Ladder 1	3	Rescue 1 (Ambulance)	2		
Total	7		8		0

Exhibit V-3 illustrates the reassignment of personnel under *Option 1*.

**EXHIBIT V-3  
REDEPLOYMENT PLAN (OPTION 1)  
(MINIMUM OF 15 ON-DUTY PERSONNEL)**

<i>Headquarters Station</i>		<i>Highland Station</i>	
UNIT	NUMBER OF FIREFIGHTERS	UNIT	NUMBER OF FIREFIGHTERS
Deputy Chief	1		
Engine 4	3	Quint Apparatus	3
Engine 1	3		
Ladder 1	3	Rescue 1 (Ambulance)	2
Total	10		5

Exhibit V-4 illustrates the reassignment of personnel under *Option 2*.

**EXHIBIT V-4**  
**REDEPLOYMENT PLAN (OPTION 2)**  
**(MINIMUM OF 15 ON-DUTY PERSONNEL)**

<i>Headquarters Station</i>		<i>Highland Station</i>	
	<b>NUMBER OF FIREFIGHTERS</b>		<b>NUMBER OF FIREFIGHTERS</b>
Deputy Chief	1		
Engine 4	4	Quint Apparatus	4
Ladder 1	4	Rescue 1 (Ambulance)	2
<b>Total</b>	<b>9</b>		<b>6</b>

**RECOMMENDATION V-1:** *Continue to maintain a minimum of 15 personnel on-duty.*

**RECOMMENDATION V-2:** *Implement redeployment, using a two-step plan, and reassign the 12 firefighters from the Park Circle Station.*

- *Initial redeployment: assign eight personnel to the Highland Fire Station and seven personnel to Headquarters Station.*
- *Final redeployment (Option 1): assign 10 personnel to Headquarters Station and five personnel to Highland Station.*
- *Final redeployment (Option 2): assign nine personnel to Headquarters Station and six personnel to Highland Station.*

**RECOMMENDATION V-3:** *Relocate personnel from Engine 3 and Rescue 2 from the Park Circle Station to the Highland Station.*

**RECOMMENDATION V-4:** *Staff Rescue 1 with two FF/EMTs.*

**RECOMMENDATION V-5:** *Staff Ladder 2 daily with an officer and two firefighters.*

**RECOMMENDATION V-6:** *Staff Rescue 2 as a second ambulance, as required.*

**RECOMMENDATION V-7:** Under the initial redeployment model, staffing should include two engine companies (each with three firefighters), two ladder companies (each with three firefighters), one rescue (ambulance), and a Deputy Chief daily.

**RECOMMENDATION V-8:** Purchase a quint apparatus (aerial apparatus with pump capability). Assign the quint to the Highland Station.

**RECOMMENDATION V-9 (Redeployment Plan Option 1):** Upon delivery of the new quint apparatus:

- Deactivate Engine 2 and Ladder 2.
- Deploy the quint apparatus to Highland Station.
- Activate Engine 1 at the Headquarters Station.
- Relocate Rescue 2 to Headquarters Station to serve as the back-up ambulance, when required.
- Assign three personnel (one officer and two firefighters) to the quint, Engine 1, Engine 4, and Ladder 1, and two personnel to Rescue 1.
- Operate with four front-line apparatus (one quint, two engines, one ladder) and the rescue (ambulance).

**RECOMMENDATION V-10 (Redeployment Plan Option 2):** Upon delivery of the new quint apparatus:

- Deactivate Engine 2 and Ladder 2.
- Deploy the quint apparatus to Highland Station.
- Assign Rescue 2 to Highland Station to serve as the back-up ambulance, when required.
- Assign four personnel (one officer and three firefighters) to the quint, Engine 4, and Ladder 1, and two personnel to Rescue 1.
- Operate with three front-line apparatus (one quint, one ladder, one engine) and the rescue (ambulance).

Exhibit V-5 illustrates the number of front-line units which would be operational under the proposed deployment options.

**EXHIBIT V-5**  
**APPARATUS - DEPLOYMENT OPTIONS 1 AND 2**

**FRONT LINE APPARATUS    OPTION 1    OPTION 2**

Ladder	1	1
Quint	1	1
Engine	2	1
Rescue	1	1

**APPARATUS RELOCATION AND DISPOSITION PLAN**

Adopting a two fire station configuration requires a review of the number and type of apparatus operated by the Fire Services Division. Additionally, the relocation, replacement and deactivation of apparatus necessitates the development of a plan which parallels the personnel redeployment plan. The following describes a plan for relocation and disposition of major apparatus to be considered by the Division:

*Upon the closing of the Park Circle Station, the Division should:*

- Relocate Engine 3 from the Park Circle Station to the Headquarters Station as a reserve apparatus.
- Relocate Rescue 2 from the Park Circle Station to the Highland Station.
- Deactivate Engine 1 as reserve apparatus at the Headquarters Station and sell the unit.

*Upon receipt of new rescue (ambulance) apparatus, the Division should:*

- Designate the new rescue as Rescue 1 and assign it to the Highland Station.
- Designate the current Rescue 1 as Rescue 2 (second front-line rescue unit) and continue to assign the unit to the Highland Station.
- Designate the current Rescue 2 as reserve Rescue 3 and assign the unit to the Headquarters Station until 2005, then transfer it to the Highland Station.

*Upon receipt of the new quint apparatus, the Division should:*

- Deactivate Ladder 2 at the Highland Station; assign it to the Headquarters Station as a spare unit, or sell the unit.
- Relocate Engine 2 to from the Highland Station to the Headquarters Station.
- Deactivate Engine 4; assign to Headquarters as a reserve apparatus.
- Deactivate Engine 3; assign to Headquarters, or sell the unit.

The following exhibit illustrates a schedule of replacement, indicating the apparatus designation, its year, make, type, general condition, replacement year, assigned location and the proposed location of the apparatus.

**EXHIBIT V-6**  
**RELOCATION AND REPLACEMENT PLAN**

Apparatus	Year	Make	Type	Condition	Replacement Year	Current Location	Proposed Location
Engine 1	1984	Pierce	1,250 GPM	Fair/Good	Do not replace	Headquarters	Deactivate (sell in 2002)
Engine 2	2000	Pierce	1,250 GPM	Excellent	2015	Highland	Highland (relocate to Headquarters in 2005)
Engine 3	1988	Pierce	1,250 GPM	Good	Do not replace	Park Circle	Headquarters (sell in 2005)
Engine 4	1992	Pierce	1250 GPM	Good	2007	Headquarters	Headquarters
Ladder 1	1994	Pierce	105' Aerial	Good	2014	Headquarters	Headquarters
Ladder 2	1975	Maxim	85' Aerial	Good SLEP 1996	2005	Highland	Highland (relocate to Headquarters in 2005)
Quint 2 (new)	2005						Highland (2005)
Rescue 1	1999	Ford	Rescue (Amb.)	Good	2004	Highland	Highland
Rescue 2	1994	Ford	Rescue (Amb.)	Fair	1999 (past due)	Highland (recently relocated from Park Circle)	Highland
Rescue 3 (new)	2003						Highland
Lighting Truck	1977	GMC		Poor	2002 (recently replaced)	Headquarters	Headquarters
Air Unit	1983	Ford		Poor	2005	Headquarters	Headquarters

Notes: SLEP = Service Life Extension Plan

GPM = Gallons per Minute

**RECOMMENDATION V-11:** *The Division should develop an apparatus relocation and deactivation schedule.*

#### **ORGANIZATION AND STAFFING OF THE FIRE SERVICES DIVISION**

Under the two-station configuration and the proposed redeployment options, it is necessary to restructure the Fire Services Division. A successful fire and rescue organization requires the balancing of line and support functions and the establishment of a clear relationship between command and control. To accomplish this goal, certain fundamental principles should be adopted. Exhibit V-7 describes each principle and applies it to the Fire Services Division.

#### **EXHIBIT V-7**

#### **PRINCIPLES OF FIRE DEPARTMENT ORGANIZATION**

<b>PRINCIPLE</b>	<b>DESCRIPTION OF PRINCIPLE</b>	<b>FIRE SERVICES DIVISION IN RELATION TO PRINCIPLE</b>
<b>SPAN OF CONTROL</b>	The principle of span of control dictates that there is a limit to the number of persons that one supervisor or manager can successfully supervise or manage, and that the ability of that supervisor or manager to discharge his or her obligations will be limited by the number of persons he or she is expected to supervise. While there is no set number in a fire organization, fire lieutenants typically supervise three or four firefighters and fire captains typically supervise three or four firefighters directly (and 12 to 16 indirectly).	Too many personnel report to the Director. The roles of operational officers (Captains and Lieutenants) require clarification.
<b>UNITY OF COMMAND</b>	The principle of unity of command states that, in any given situation, a person should have one and only one immediate superior to whom he or she is accountable. This principle is important in fire department and emergency work in those common situations in which members of different organizational units (e.g., fire companies) are working together at one time and the issue of "who is in charge" is raised. Written directives usually state how such situations should be handled. In their absence, confusion and duplication of effort will often occur.	Deputy Chiefs serve as incident commanders.
<b>RANK AND POSITION COMMENSURATE WITH AUTHORITY</b>	The purpose of rank is to designate authority and formal status within the organization. Fire departments typically rely on a military rank structure. In a fire department the size of Arlington, the first level supervisor is usually a lieutenant who serves as the supervisor of a fire unit on a particular shift. Fire captains typically supervise overall fire company operations on several shifts.	The rank structure and responsibilities assigned to officers should be evaluated.



PRINCIPLE	DESCRIPTION OF PRINCIPLE	FIRE SERVICES DIVISION IN RELATION TO PRINCIPLE
CHAIN OF COMMAND	This principle is derived from the military practice of ensuring that information is communicated upward and downward through the organization by means of ascending and descending levels of authority. In a quasi-military organization, where reliance upon order and discipline is important, it is imperative that the chain of command be followed closely so that each level of authority is informed of actions that are occurring.	The company level chain of command requires adjustment.
FUNCTIONAL ARRANGEMENT	This principle states that it is in the interest of efficiency to have similar functions performed by the same, or related, units and to group similar functions under a single point of command, or supervision. For example, the functions of prevention, plans review, and inspection are similar and should be performed under a single point of command to ensure comparability, optimum coordination and minimum redundancy. Similarly, different operations activities, such as fire suppression and emergency medical services, should be grouped together in a single division, commanded by a single person.	Functions are generally well organized, but require consolidation. Operational and staff personnel report directly to the Director. Each group Deputy Chief is responsible to the Director.
ORGANIZATION CHART	It is essential that a fire department, regardless of size, have a published organization chart that displays each operating division and its subdivisions and which clearly and logically depicts the vertical and horizontal relationships among all organizational units. The organization chart may also include a description of the ranks of the personnel in command of, and assigned to, each unit.	

The organization structure of the Division of Fire Services requires restructuring. Too many personnel report directly to the Director and there is a need to strengthen the staff capability of the Division. Additionally, the company rank structure should be reconfigured.

#### *FIRE COMPANY ORGANIZATION*

The current company officer structure provides that two groups/shifts have two Captains and three Lieutenants and two groups/shifts have one Captain and four Lieutenants. The consultants' approach to the organization of operational units is to organize personnel by group/shift (as is the current practice), but also to organize companies under the overall direction of one Captain, supported by three Lieutenants. Thus, the number of Captains and Lieutenants in operations assignments is a function of the number of fire companies. Under the options shown above, there will be three or four front-line companies. The consultants believe that operating with three front-

line companies is the most appropriate approach. Each company should have four officers, one Captain and three Lieutenants. There would be a total of three Captains and nine Lieutenants assigned to companies.

In this type of organization, one command officer has overall responsibility for each fire company. A fire company Captain is responsible for the administrative oversight of a company and the condition of the apparatus, equipment and personnel under his or her command. This chain of command within a fire company places appropriate administrative responsibility with the Captain and individual group responsibility with the three Lieutenants.

***RECOMMENDATION V-12: Assign one Captain and three Lieutenants to each fire company.***

***FIRE SERVICES DIVISION ORGANIZATION***

Three possible organization structures should be considered for the Fire Services Division. While each option has advantages, it is the consultants' view that Option 2 is the most desirable. The other options provide a basis for comparison and allow the Town to consider other approaches, given the Town's unique circumstances.

Each of the organization models shown below assumes three front-line companies (one engine, one quint, one ladder company, with four personnel assigned to each company). If a four front-line apparatus model is adopted, the rank structure of the operations section of the Division would be altered.

Option 1 provides for two Assistant Chiefs, one for Operations and one for Support Services. The Assistant Chiefs would report to the Director. Each group Deputy Chief, a Captain for training and a Lieutenant for safety/EMS would report to the Assistant Chief for Operations. A fire prevention Captain and a Lieutenant for support services would report to the Assistant Chief for Support Services. The Assistant Chief for Support Services would also serve as the planning officer for the Fire Services Division. Option 2 is similar to Option 1, but there would be a Captain assigned to safety and a Captain assigned to support services.

Option 3 differs from the first two options in several significant ways. First, three officers (Deputy Chiefs, could be called Assistant Chiefs) would

report to the Director. One Chief would oversee operations, one would oversee prevention and one would oversee support services.

**RECOMMENDATION V-13: *Reorganize the Fire Services Division.***

Exhibit V-8 shows the number of personnel by rank under the current structure and three optional arrangements. Option 2 is the most desirable model.

**EXHIBIT V-8  
CURRENT ORGANIZATION AND PROPOSED ORGANIZATIONAL MODELS**

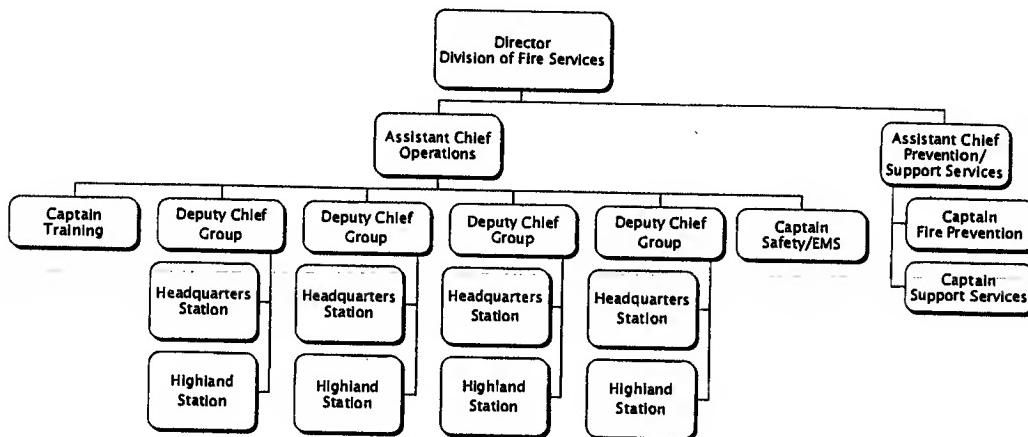
POSITION	CURRENT ORGANIZATION	OPTION 1	OPTION 2	OPTION 3
Director	1	1	1	1
Assistant Chief	0	2	2	0
Deputy Chief	5	4	4	7
Captain	7	5	7	6
Lieutenant	14	11	9	10
Firefighter	59	63	63	62
Total	86	86	86	86

The Assistant Chief positions should be management positions and should be the key part of the Director's management team. Compensation should be sufficient to make the positions desirable.

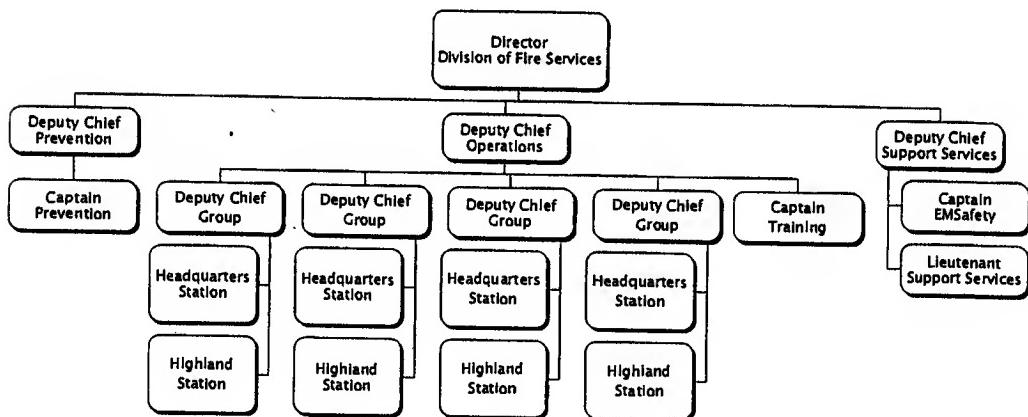
**RECOMMENDATION V-14: *The Assistant Chief positions should be management positions.***

The following two organization charts illustrate the possible models to consider. Exhibit V-9 shows the proposed organization of the Division under the most desirable model, Option 2. (Option 1 would be similar, except that the EMS/safety officer and the support services officer would be Lieutenants under Option 1.)

**EXHIBIT V-9  
PROPOSED ORGANIZATION - OPTION 2**



**EXHIBIT V-10  
PROPOSED ORGANIZATION - OPTION 3**



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## VI. EMERGENCY MEDICAL SERVICES

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Emergency Medical Services are delivered in the Town of Arlington through a bifurcated system. Armstrong Ambulance Company (AAC) provides advanced life support (ALS) and the Fire Services Division provides basic life support (BLS). Armstrong Ambulance Company provides a non-transporting vehicle for ALS support and the Division provides a first responder engine company (or a ladder, if an engine is not available) and a BLS ambulance for patient transport.

All personnel are trained in basic first aid and certified in the use of automatic external defibrillators (AEDs). Sixty personnel are trained and certified at the Emergency Medical Technician-Basic Provider level (EMT-B).

The Fire Services Division performs third-party billing for ambulance transport and the Town retains all reimbursements from BLS transports. AAC is reimbursed by the Town for the ALS support they provide. AAC is committed to maintain at least one ALS vehicle in the vicinity of Arlington for ALS responses and back-up BLS ambulance services; the Fire Services Division normally staffs only one ambulance.

The consultants' general approach to reviewing an emergency medical service system is that if a system is effective and operational, efforts should be made to supplement and support the system, not replace the system. In Arlington, Armstrong Ambulance Company has somewhat of a unique relationship in that it is headquartered in the Town and provides services to the Town. It is also our understanding that Armstrong provides ALS and BLS services to a consortium of local governments; the number of municipalities in this consortium has recently been reduced. From an operational perspective, the Town should continue to support the existing emergency medical response system, but it should develop safeguards to ensure that there is a reasonable capacity to provide EMS at the ALS level, should the private provider discontinue the provision of services. It is important that the current system be maintained, since it would take several years for the Town to develop an ALS response capability.

It should be noted that the consultants have assumed that the Town of Arlington desires to provide ALS services to its residents. The determination of the level of service to be provided should be the result of an explicit policy choice by local leaders.

**RECOMMENDATION VI-1:** *Continue the dual response of a first responder company and an ALS provider for life-threatening emergencies (ALS response).*

The Fire Services Division's response protocols provide that first responder fire companies respond, along with Rescue 1 (ambulance), to both basic life support (BLS) and advanced life support (ALS) calls for service. This policy should be altered to limit the response of fire companies to ALS requests, unless assistance is required by the ambulance. Fire companies should be dispatched and respond to EMS incidents which are determined to be ALS. To effectively dispatch EMS personnel to ALS or BLS calls requires the implementation of an emergency medical dispatch (EMD) system, which screens and prioritizes calls. To implement EMD, the Town must train all dispatch personnel as emergency medical dispatchers. This training process has begun and some dispatch personnel have been trained.

**RECOMMENDATION VI-2:** *Discontinue the practice of deploying a first responder fire company to non-life-threatening medical emergencies (BLS), as determined by emergency medical dispatching procedures.*

**RECOMMENDATION VI-3:** *Continue to deploy a first responder fire company to life-threatening medical emergencies (ALS) as determined by emergency medical dispatching procedures.*

**RECOMMENDATION VI-4:** *Continue to implement an emergency medical dispatch system.*

To ensure that the Town has sufficient capacity to support its emergency medical response system, the Town of Arlington should discuss and adopt a series of policies which increases the capacity of the Fire Services Division. The Town should determine the extent of the EMS participation desired, the

number of EMT-Paramedic trained personnel, how the system will be integrated with the current response framework, and a time line for developing the increased capacity.

**RECOMMENDATION VI-5:** *The Fire Services Division and the Town Manager's office should develop a specific plan to determine the number of EMT-Paramedic trained personnel required to provide ALS services.*

**RECOMMENDATION VI-6:** *Use civil service selective certification procedures to seek recruits who are trained and certified as Commonwealth of Massachusetts EMT-Paramedics, prior to employment.*

**RECOMMENDATION VI-7:** *Consider the development of an EMT-Paramedic training program within the Division to provide for selected training of current personnel who may aspire to be trained as EMT-Paramedics.*

**RECOMMENDATION VI-8:** *Upon recruiting and training an adequate number of EMT-Paramedics into the Division, upgrade the current first responder program from a BLS delivery system to an ALS delivery system.*

To provide two EMT-Ps on-duty 24 hours a day, 365 days a year would require the Fire Services Division to employ approximately ten to 12 EMT-Ps.

**RECOMMENDATION VI-9:** *Apply to the Commonwealth of Massachusetts for a waiver to respond to medical emergencies as an ALS provider through a first responder program.*

Any application for a waiver would require a great deal of planning. Additionally, the Division would require several years to prepare for such a process.

## **VII. PLAN OF IMPLEMENTATION**

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This report provides several major recommendations which represent a plan for the future development of the Arlington Fire Services Division. Determining the fire station configuration for the Town is the primary issue addressed in this report. Most of the other recommendations relate to the decision to operate with two or three fire stations. Thus, the underlying policy issue which must be determined is whether there should be two or three operating fire stations.

It is clear from our analysis that the two-station response configuration provides a high level of service throughout the Town. Moreover, the two-station configuration, coupled with a new deployment strategy, in our view provides a stronger system than the one which is currently in operation. Adopting the consultants' recommended option calling for three-front line pieces of apparatus, staffed with four personnel (one officer and three firefighters) enhances the effectiveness of crews and provides for improved firefighter safety.

### **PLAN OF ACTION**

The Town should adopt a plan of action which accomplishes the following major recommendations in the next 12 to 18 months:

#### *PHASE ONE*

Phase One actions can be undertaken rather rapidly and need to be completed prior to implementing other recommendations.

- Adopt the two fire station configuration and decommission the Park Circle Fire Station.
- Continue with plans to renovate the Headquarters and Highland Fire Stations.
- Redeploy personnel in accordance with the initial redeployment plan described.
- Immediately begin the process of purchasing a quint.
- Begin the process of creating two Assistant Chief positions.

**PHASE TWO**

Phase Two tasks are, in part, dependent on the purchase of a quint apparatus.

- Create a staffing plan for the new fire company structure.
- Implement the Option 2 deployment model, staffing the quint unit and other fire companies with four personnel.

**PRIORITY OF RECOMMENDATIONS**

This report contains 26 major recommendations concerned with a range of significant issues, such as decommissioning the Park Circle Station, the reorganization of the Division, a revised rank structure and the redeployment of personnel. While we consider all the recommendations contained in this report to be important, this section is intended to place the recommendations into a framework which provides a sequential methodology of implementation. The recommendations contained in this report have been categorized as follows:

**PRIORITY 1:** Those recommendations which should be implemented without delay and which bear most directly on the ability of the Division to provide services and operate in an efficient manner. Priority 1 items need to be addressed immediately, even though they may require several months or years to implement completely.

**PRIORITY 2:** Those recommendations which are important to the effective and efficient operation of the Division and which should be implemented as soon as reasonable and practical.

**PRIORITY 3:** Those recommendations which can contribute to the continued improvement of the Division and which should be implemented as soon as resources and operating conditions permit.

The recommendations are listed in Exhibit VII-1 in the order in which they are found in the report, with an assigned priority.

**EXHIBIT VII-1**  
**LIST AND PRIORITY OF RECOMMENDATIONS**

RECOMMENDATION	PRIORITY
IV-1 The Town should decommission the Park Circle Fire Station.	1
IV-2 The Town should provide fire and rescue services using a two fire station configuration.	1
IV-3 Headquarters and Highland Stations should be retained as the base of operations for a two-station response system.	1
V-1 Continue to maintain a minimum of 15 personnel on-duty.	1
V-2 Implement redeployment, using a two-step plan, and reassign the 12 firefighters from the Park Circle Station.	1
V-3 Relocate personnel from Engine 3 and Rescue 2 from the Park Circle Station to the Highland Station.	1
V-4 Staff Rescue 1 with two FF/EMTs.	1
V-5 Staff Ladder 2 daily with an officer and two firefighters.	1
V-6 Staff Rescue 2 as a second ambulance, as required.	2
V-7 Under the initial redeployment model, staffing should include two engine companies (each with three firefighters), two ladder companies (each with three firefighters), one rescue (ambulance), and a Deputy Chief daily.	1
V-8 Purchase a quint apparatus (aerial apparatus with pump capability). Assign the quint to the Highland Station.	1
V-9 Implement Redeployment Plan Option 1.	1/2
V-10 Implement Redeployment Plan Option 2.	1/2
V-11 The Division should develop an apparatus relocation and deactivation schedule.	2
V-12 Assign one Captain and three Lieutenants to each fire company.	2
V-13 Reorganize the Fire Services Division.	2
V-14 The Assistant Chief positions should be management positions.	2
VI-1 Continue the dual response of a first responder company and an ALS provider for life-threatening emergencies (ALS response).	1
VI-2 Discontinue the practice of deploying a first responder fire company to non-life-threatening medical emergencies (BLS), as determined by emergency medical dispatching procedures.	1

RECOMMENDATION	PRIORITY
VI-3 Continue to deploy a first responder fire company to life-threatening medical emergencies (ALS), as determined by emergency medical dispatching procedures.	1
VI-4 Continue to implement an emergency medical dispatch system.	1/2
VI-5 The Fire Services Division and the Town Manager's office should develop a specific plan to determine the number of EMT-Paramedic trained personnel required to provide ALS services.	3
VI-6 Use civil service selective certification procedures to seek recruits who are trained and certified as Commonwealth of Massachusetts EMT-Paramedics, prior to employment.	3
VI-7 Consider the development of an EMT-Paramedic training program within the Division to provide for selected training of current personnel who may aspire to be trained as EMT-Paramedics.	3
VI-8 Upon recruiting and training an adequate number of EMT-Paramedics into the Division, upgrade the current first responder program from a BLS delivery system to an ALS delivery system.	3
VI-9 Apply to the Commonwealth of Massachusetts for a waiver to respond to medical emergencies as an ALS provider through a first responder program.	3

#### TIMETABLE FOR IMPLEMENTATION

The consultants have proposed a time line for the implementation of the major recommendations in this report. The timetable outlines changes and provides an approximate number of months to consider for implementation.

#### EXHIBIT VII-2 TIMETABLE TO IMPLEMENT RECOMMENDATIONS

RECOMMENDATIONS OR TASKS TO BE COMPLETED	TIMETABLE
Town reviews recommendations and determines those to be implemented.	2 months
Decision made to decommission Park Circle Station.	6 months
Decision made to purchase a quint.	3 to 6 months
Plan the redeployment of personnel.	6 months
Initial redeployment of personnel completed.	6 to 12 months
Implement new response procedures limiting the response of first responder companies to BLS calls.	6 to 12 months

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<b>RECOMMENDATIONS OR TASKS TO BE COMPLETED</b>	<b>TIMETABLE</b>
Rehabilitation of fire stations.	6 to 24 months
Determination made regarding the role of the Fire Services Division in providing ALS.	12 months
Determine whether some EMT-Bs are to be trained to the Paramedic level and whether to use a selective certification process.	12 months
Determine whether the Division is to operate with three or four front-line apparatus.	12 to 15 months
Create two Assistant Chief positions.	12 to 15 months
Quint unit becomes operational.	TBA
Final redeployment of personnel implemented.	36 months

## **APPENDIX**

### **EMERGING TRENDS AND BEST PRACTICES**

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Many emerging fire and rescue trends, best practices and general local government trends will continue to affect fire and rescue services. Fire departments have traditionally been measured in relation to defined standards and recognized industry practices.

The text of this report defines principles associated with fire and EMS response. In addition, there are other conditions and developments that are changing the operations and administration of the fire and rescue services, including:

- ▶ legislative, regulatory and industry standards
- ▶ emergency communications/regional system development
- ▶ emergency medical services
- ▶ operational consolidation (field operations consolidation)
- ▶ human resources
- ▶ risk management
- ▶ increased customer service focus
- ▶ increase in service delivery specialties
- ▶ technology and equipment
- ▶ accreditation

#### **LEGISLATIVE, REGULATORY AND INDUSTRY STANDARDS**

There are a number of legislative, regulatory and industry standards which are causing changes in local fire service organizations. Some of these standards have long histories, and some reflect fairly new initiatives. Proposed guidelines and standards emerge from committee processes. These technical committees review data, research and actual experiences of fire and rescue agencies when establishing these standards.

The two primary agencies involved with establishing fire-related standards are the Insurance Services Office (ISO) and the National Fire Protection Association (NFPA).

*ISO/CRS.* The Insurance Services Office is a national nonprofit organization providing services to the property and casualty insurance industry. ISO has a nonprofit subsidiary corporation, Commercial Risk Services (CRS), which provides public protection surveys. The ISO Fire Suppression Rating Schedule evaluates municipal fire suppression capability using three major criteria: the fire alarm process (how a fire is reported and how a fire department receives a report); the fire department (apparatus, equipment, staffing, training, mutual aid, automatic mutual aid, pre-fire planning, training, etc.); and the water system (supply, water main capacity to deliver fire flow, distribution of hydrants, etc). These ISO criteria are very detailed and are assigned weights. For example, the schedule defines, in detail, the type of equipment an engine company should have. The outcome of an ISO evaluation is the assignment of a jurisdiction to one of ten Public Protection Classifications. (Class 1 is the highest possible rating and Class 10 is the lowest.) This classification system is used to establish rates associated with fire insurance coverage and has a significant impact on commercial and industrial insurance rates.

*National Fire Protection Association.* The NFPA develops many standards applicable to fire departments. Two of the more frequently discussed standards are NFPA 1500 (health and safety) and the controversial NFPA Standard 1710 (response time and staffing).

NFPA Standard 1500 (*Standard on Fire Department Occupational Safety and Health Program*) evolved to address the large number of fatalities and occupation-related injuries in fire departments. NFPA 1500 covers a range of safety issues and has resulted in a number of other standards relating to fire department incident management, infectious disease control, medical requirements for firefighters, and creation of the fire department safety officer concept. (A safety officer has responsibilities related to incident management.)

NFPA Standard 1710, which has been discussed in the text of this report, sets forth requirements concerning the organization of fire suppression and fire-based EMS services. The standard discusses staffing requirements and maximum response times to fire and EMS incidents.

NFPA Standard 1710 (applicable to career fire departments) was adopted along with Standard 1720 (applicable to volunteer departments), and Standard 1730 (applicable to combination departments, those departments operating with a combination of career and volunteer or call personnel).

The International City/County Management Association, the National League of Cities, the Public Risk Management Association, the International Personnel Management Association, and other associations have filed complaints with the American National Standards Institute (ANSI) to withdraw Standards 1710 and 1720. The ANSI has an oversight role relating to standards set by organizations, such as NFPA, and evaluates the methods by which standards are adopted.

Many other NFPA standards are used as guidelines by fire departments, for example: NFPA 1001, *Standard on Fire Fighter Professional Qualifications*, NFPA 1021, *Standard for Fire Officer Professional Qualifications*, and NFPA 1002, *Standard for Fire Apparatus/Driver/Operator Professional Qualifications*. There are also standards for protective clothing, breathing apparatus and other matters.

#### EMERGENCY COMMUNICATIONS/REGIONAL SYSTEM DEVELOPMENT

There are a number of recent developments in the area of emergency communication. The most obvious are technological. Emergency communications appear to have caused a significant changes in fire and EMS operations. A major communication development has been emergency medical dispatch (EMD). EMD systems establish a framework for screening EMS calls and classifying them by seriousness. As a result, EMD training programs have been developed. For example, Arlington has trained some of its dispatchers in EMD. EMD provides for call screening and allows dispatchers to give pre-arrival instructions. While these systems provide high-quality service, they have had a direct impact on dispatch staffing. A dispatcher can be committed to a call for a substantial period of time, which often requires an increase in the number of dispatchers. However, there has been some movement to create consolidated fire and EMS communications systems around the country, and in Massachusetts. For example, Barnstable County has developed a regional fire and EMS communication system used by five fire departments. A number of

other fire departments have expressed an interest in joining the system. In addition, fire chiefs in several towns in Norfolk County are aggressively attempting to get support for a regional communications system.

MMA Consulting Group, Inc. recently reviewed data in one region in which nine fire and EMS departments, having a volume of approximately 25,000 calls per year, employed at least one dispatcher on-duty at all times. Thus, there were nine to 12 dispatchers on-duty. (The communities employed about 50 dispatchers in total.) If communications were provided by one agency, a system employing about 20 personnel could effectively manage the call load and provide EMD dispatching.

An outgrowth of mutual aid is automatic mutual aid, provided by another department without request as a result of a predetermined protocols (e.g., location of call or type resources needed). An integrated communications system serving several fire or rescue agencies automatically dispatches units based on predetermined protocols and availability. The effect of joint communications is to integrate the operations and response approach of each agency. This also allows the use of a variety of management deployment strategies, such as "moving up" units to "cover" for other units that are committed to incidents and less need to make call-backs. Practices such as "status system management" can be used for EMS units. Under status system management, ambulance units are deployed based on demand for service, which allows for varying the number of units based on demand (time of day, day of week) and the location of units. This allows for more effective staffing, cost control and system efficiency.

The development of emergency communications (911 and E-911) has resulted in substantial call volume to emergency numbers for non-emergency calls. A number of jurisdictions in the United States are experimenting with the non emergency service number 311. The objective of this effort is to reduce the number of non-emergency calls to 911.

#### **EMERGENCY MEDICAL SERVICES**

The provision of some level of emergency medical services by fire departments is a well-established practice. Services are provided in a number of ways. Some developments include EMD, response protocol revisions, increasing EMS training level for fire companies, and use and distribution of defibrillators.

*EMD.* Emergency medical dispatch procedures (see above) allow dispatchers to evaluate the seriousness of calls using a call screening process and to make differentiations between life-threatening and non-life-threatening calls. National data, as well as the consultants' experience, indicate that incoming calls can be categorized, in general as follows: 40 percent of calls are advanced life support calls (ALS, life-threatening calls); 50 percent are basic life support calls (BLS, non-life-threatening calls); and 10 percent are trauma calls.

*Response Protocol Revisions.* The practice of many fire departments has been to design EMS response systems in which a first responder engine company is deployed to each emergency medical service call. However, as systems have evolved, fire departments have been more discriminating in response policies. This is particularly true when emergency medical dispatch procedures are implemented. Many fire departments do not automatically deploy fire units to BLS calls; however, they automatically deploy units to ALS calls (life-threatening situations). This policy has been adopted by many agencies for a variety of reasons. If units are committed to BLS incidents, they are not available for ALS incidents. Committing fire companies excessively may not be a wise deployment choice.

*Increasing EMS Training Level for Fire Companies.* Some jurisdictions have established paramedic engine companies. These units may be strategically deployed to respond to fire and EMS (ALS) incidents in areas where ambulance response may be problematic, or to ALS calls prior to arrival of a more distant ambulance.

*Use and Distribution of Defibrillators.* The development of Automatic External Defibrillators (AEDs), which require a modest level of training, are typically placed on most fire apparatus, and increasingly in police vehicles. The use of defibrillators is essential, since the survivability for a non-breathing person is a function of application of CPR, defibrillation and advanced life support.

#### **OPERATIONAL CONSOLIDATION (FIELD OPERATIONS CONSOLIDATION)**

Under operational consolidation, fire departments remain separate, but operate in a combined manner for response purposes. Operational

consolidation often evolves as communications are integrated and detailed standard response protocols are developed. Typically, this model may develop and operate effectively when jurisdictions have similar service levels. For example, Arlington, Belmont, Winchester, and other nearby towns have a similar level of service and staffing which lends viability to operational consolidation.

## HUMAN RESOURCES

There are several evolving practices with respect to human resources management reflecting national and specific Massachusetts trends. These trends include increasing entry qualifications, mandatory entry qualifications or condition of employment qualifications, and diversification of the work force.

*Entry Qualifications.* Entry qualifications for firefighting personnel in Massachusetts are limited. In Massachusetts, the entry requirements do not include a high school diploma or equivalency. In other parts of the country, requirements are usually higher. Since much of the work of fire and rescue departments now requires more sophisticated training, not only for emergency medical services, but hazardous materials, bio-hazards, etc., many jurisdictions are beginning to require more competencies as a condition of employment.

*Mandatory Qualifications for Employment and Conditions of Employment.* Many fire and rescue departments are requiring, as a condition of employment, that personnel be trained to the emergency medical technician basic level (EMT-B) before employment, or even to the paramedic level (EMT-P). Other departments are requiring that personnel reach certain levels of training within specified time parameters. In Massachusetts, the appointing authority may request a special civil service list seeking specific qualifications, such as paramedic training, as long there is a *bona fide* occupational reason for such a list.

*Diversification of the Workforce.* There has been a broad national effort to diversify the fire service to increase the number of women and minority firefighters and emergency medical personnel.



*Promotional Examinations and Civil Service in Massachusetts.* The Massachusetts Human Resources Division (HRD) has traditionally used written examinations for promotional processes. The HRD, however, will delegate to a municipality the responsibility for conducting a non-traditional examination process. These examination processes are under the general supervision of HRD and typically have consisted of oral panels or assessment centers. Assessment centers are processes in which candidates participate in a series of exercises evaluating leadership, supervisory, and management skills. These processes have been used for positions such as Fire Chief, Deputy Fire Chief, Fire Captain and Fire Lieutenant.

*Advanced Academic and Professional Education and Training.* Nationally, and in Massachusetts, there are increasing numbers of firefighters with college degrees and advanced degrees. Some union organizations have sought the introduction of educational incentive programs which provide for pay increases, or fixed annual payments, for attainment of college degrees. In addition, many command personnel within fire departments are participating in programs at the National Fire Academy. The Executive Fire Officer (EFO) program is one of the most well-known programs and completion of the program is often regarded as a desirable qualification for promotion.

#### RISK MANAGEMENT

Two types of risk management are growing within fire and rescue organizations. Internal risk management is concerned with reducing accidents, injury and sickness on the job. As a result, there has been a rapid growth of health and wellness programs, including the development of specific health programs (e.g., requiring specific inoculations, or as in Massachusetts, prohibiting smoking). Risk management is also applied to the assessment of risk at an operations scene. For example, at a working fire, there should be a designated safety officer, who monitors operations and has authority (notwithstanding rank) to halt all operations if conditions warrant it.

#### CUSTOMER SERVICE FOCUS

Fire and rescue organizations are increasingly concerned with customer service. There are many examples, including the national program in which fire

stations are identified as safe places for lost children and the provision of first aid. In addition to these traditional service functions, many fire departments are training personnel to identify other health, safety or social service related problems. Under these "connector services" programs, firefighters who come in contact with possible family situations or an aged person at risk report these observations to appropriate agencies.

#### **INCREASE IN SERVICE DELIVERY SPECIALTIES**

The development of technical rescue specialties within fire departments by means of regional resource sharing is growing. Particular areas of technical rescue include confined space, building collapse, trench rescue, industrial accidents, etc. The skills developed are generally a function of the characteristics of the community or the region.

#### **TECHNOLOGY AND EQUIPMENT**

Changes in technology, equipment and apparatus are having a significant impact on safety and operations. For example, use of thermal imaging devices, instruments measuring the stability of walls, improved protective clothing and uniforms, and breathing apparatus with radios built into masks are now common. More extensive use of computers in apparatus designed to provide information on buildings and hazards are also more common.

Apparatus are changing in several ways. Some fire suppression apparatus are becoming smaller and more specialized. At the same time, there is the generalization of equipment rather than specialization of equipment. Rapid intervention vehicles, such as rescue-pumpers, flying squads with pumps, ambulance-pumpers, combined hazardous materials and command post vehicles, combined lighting and air trucks and modern tanker-pumpers are increasingly common. Some departments have two or more specialized vehicles available for immediate use by responders, depending on the type of call. For example, a pumper crew may be able to select a pumper or a medical aide car, depending on whether the call is a fire call or an EMS call.

#### **ACCREDITATION**

The International Association of Fire Chiefs and the International City/County Management Association have created a Commission on Fire

Accreditation. The Commission has established guidelines and standards and specifies a process for fire departments to achieve accreditation.

#### APPLICATION OF TRENDS TO ARLINGTON

While the application of these emerging fire and rescue trends and best practices is speculative, applying them to Arlington should be considered when the Town and the Division are considering long-term planning. In the following chart, several key features are listed (facilities, equipment and staffing) with a comparison made between the current year (2002) and 2012. We have assumed that the Division will eventually move to the two fire station operational model.

FEATURE	CURRENT (2002)	TEN YEARS (2012)	COMMENT
<i>Facilities</i>	3 stations	2 stations	The number of stations affects both staffing and major apparatus needs.
<i>Apparatus</i>	Front-line units: 3 Engines 2 Ladders 1 Rescue	Front line units include: 1 Engine 1 Ladder 1 Quint 1 Rescue	It is anticipated that the apparatus fleet recommended is adopted. Apparatus needs vary, depending on the number of fire stations. The type of apparatus may evolve as technology changes. It has been recommended that a quint apparatus be acquired.
<i>Staffing</i>	86	86	Assuming no change in basic services, the staffing would remain as currently constituted and recommended. Operating an additional rescue (ambulance) 24 hours per day, if necessary, will require at least 8 personnel (4 groups x 2 persons per group, or 8 personnel). More likely, staffing an additional ambulance will require 10 personnel (4 groups x 2 personnel, plus 2 relief personnel to account for time off).
<i>Crew size</i>	3	4	Fire apparatus crew sizes of four persons will become the norm.

Demand for service is likely to increase as a result of some growth in emergency medical service calls; however, with the implementation of emergency medical dispatching (sophisticated call screening), the impact on response is mitigated, since a more defined response is made to calls for service. An increase in fire calls is not anticipated.

Because of the geographic size of Arlington and surrounding jurisdictions, there are several factors which the Arlington Fire Services Division and the Town should consider for the future.

*Emergency Communications.* Economies of scale and the ability to share resources would be gained by regional and sub-regional fire and emergency medical dispatch consolidation. Sharing resources is cost effective and results in high quality dispatch services. The Town should develop a long-term strategy to develop a regional fire and EMS communication system.

*Operational Consolidation.* Regional dispatch services encourage operational consolidation. Operational consolidation results in integrated response by a group of fire departments. Jurisdictional boundaries are not considered; rather, the most appropriate units are dispatched.

The national trend encouraging more strategic planning and concern for the safety of fire response personnel are anticipated to have an effect on several aspects of the Fire Services Division's activities.

*Emergency Management.* Planning for and anticipating emergency response needs in the event of large scale incidents will consume more time. The ability to coordinate existing Town resources (i.e., fire, police, public works and health agencies) in an emergency will be a major emphasis of planning efforts.

*Risk Management.* Assessing risk at an emergency scene and the ability to change tactics to respond to risks will require improved training of company officers and incident commanders.

*State Agency Involvement.* Regulations, standards, and guidelines developed by State agencies are likely to affect administrative and operational practices. These State initiatives are likely to affect training of personnel, emergency medical services, emergency management, civil service examinations, environmental protection and other matters.



The proposed reorganization described in this report is designed to create the capability within the Division to plan for change, anticipate needs and respond to new standards and state and federal requirements. Operational policies will require revision; emergency management strategies will require careful review; and the level of communication among Town agencies, and with other jurisdictions, will increase as a result of planning efforts.

Several key trends in human resources will continue to affect the Division:

*Training.* The type and methods of training will change. Computer-based training and simulations will become more common.

*Continuing Education.* There will be a demand for educational opportunities for existing personnel. Moreover, the level of education and specialized training of personnel is likely to increase, along with an increase in entry qualifications.

*Promotions.* Examinations for promotion to company and chief officer will be altered to require more knowledge, skills and abilities associated with planning and supervision. Civil service examinations will contain both written and performance based elements.

Many of the issues related to training, continuing education, educational incentives and promotional criteria will require negotiation with employee unions.